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**ENCYCLOPEDIA
OF
PSYCHOLOGY**

ENCYCLOPEDIA OF PSYCHOLOGY

Edited by
Philip Lawrence Harriman

And Written by
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EDITOR'S PREFACE

This volume has been planned to accomplish three major purposes. First, it is designed to meet the requirements of the serious investigator who wishes to acquaint himself with various topics in modern psychology which lie outside his field of special interest and competence. No encyclopedia can ever supplant the need for a study of primary references, of course; but there is great value in encyclopedic surveys which suggest leads for deeper study and which supply the necessary orientation. Particularly is this true if the preliminary orientation be written by those who have achieved distinction through contributions to special areas within the science of psychology. Secondly, the undergraduate and the graduate student often voice a desire for a book which may extend their acquaintance with topics mentioned in lectures or encountered in their reading. Owing to the exigencies of time, many important topics may receive only a passing reference in classes and seminars; hence this volume should be serviceable in the enrichment of various topics by initiating the student into an intensive exploration of the primary data. In addition, it furnishes a useful book in which the student can browse with pleasure and benefit. Thirdly, it is intended to emphasize some of the trends in contemporary psychology which seem to have supplanted much of the traditional material. Consequently, in the apportionment of space, it was considered to be a justifiable procedure to omit certain topics in order to allot space to others. To the expert psychologist, this method may seem to be cavalier and presumptuous, especially if his own specialty be omitted or underemphasized. By way of extenuation, the Editor pleads that a single-volume encyclopedia necessarily imposes restrictions upon problems of emphasis. A careful study of research literature and of topics of papers read in meetings of psychologists, however, lends support to the procedure of selection.

If it were possible to commence with a sentence definition of psychology which would *satisfactorily delimit the field and which would*

be accepted by all students of the science, the difficulties encountered by the editor of a *handbook* or an encyclopedia would be *considerably easier*, though less challenging and stimulating. The author of an introductory textbook of psychology, however, may well suggest that the entire volume is actually the definition or might even express the wish that a definition could be placed at the end, not the beginning, of the text. This disagreement about the precise denotation of *psychology*, nevertheless, is more of a problem in semantics than a real issue in contemporary psychology. Actually, all competent authorities now agree that psychology is the application of the scientific method to a study of behavior of living organisms. Let it be hastily added that most psychologists would insist upon having an opportunity to amend and amplify this tentative definition. Furthermore, the modern psychologist takes the point of view that man is a biological organism in a social environment and that everything which makes him characteristically human is the result of learning. Hence the psychologist is inevitably concerned with the biological basis of behavior with the facts regarding growth and development, and with all the complexities of the social setting which influence, and which are influenced by, man. That knowledge about such matters is valid only when it rests upon experiments is a truism regarding which few would disagree.

For centuries, psychology was a subdivision of philosophy. This period Ebbinghaus has referred to as "its long past." Only in comparatively recent decades has it emerged from "the mother of sciences" and achieved status as an independent field of knowledge in which the methods of the philosopher have little to contribute. These decades Ebbinghaus has called "its recent history." Within the short period of a scientific attack upon psychological problems most psychologists would readily assent, more valid knowledge has been acquired than in the centuries of philosophical reflection and speculation. Still, however, the field is not

clearly marked out, and many of the old philosophical controversies set the problems for experimental investigation and influence the interpretation. Ideally, of course, when events have been adequately described, both interpretations and explanations are superfluous. As a matter of fact, the body of knowledge about psychology is already so extensive that books on "conflicting points of view" now seem a bit outmoded. Nevertheless, there is a persistent interest in the interpretation of experimental findings and in an evaluation of scientific discoveries. Here, then, the psychologist does encounter spirited opposition; consequently, many of the topics in this volume lead to stimulating discussions and point the way to critical evaluations upon the part of the earnest student. On the other hand, the psychologists who are inclined to stress the experimental nature of their science point out the fact that all explanations and interpretations are by necessity tautological and that at the present stage of development psychology will advance more rapidly in accumulating valid knowledge if philosophical matters are left to the philosophers.

Editors of handbooks and encyclopedias owe such a debt of gratitude to their contributors that repayment in words is impossible. From a large number of competent scholars this Editor obtained articles for this volume. Perhaps the most effective appeal to these busy persons was the statement that the volume would be of great value to the student and the young instructor. At any rate, practically everyone who was invited to contribute an article on his specialty did so in a spirit of generous cooperation, even though work of this type is obviously non-remunerative. For their assistance the Editor acknowledges his thanks. He is also indebted to his secretary, Mrs. Virginia Haelele, who spent many hours in the more tedious aspects of preparing this volume for the press. If the *Encyclopedia of Psychology* serves in any way whatsoever to advance the science of psychology, to assist the neophyte, and to challenge the mature scholar to add to its corpus of valid knowledge, then all who participated in this undertaking are amply repaid.

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ENCYCLOPEDIA
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A

ADOLESCENCE.—Adolescence as a phenomenon among the young of all social classes is largely a product of modern culture and civilization. The great-grandparents of present-day adolescents finished their schooling by the age of twelve or thirteen, went to work shortly thereafter, married any time after sixteen, and were living an adult life by the age of eighteen. It is only recently that education has been extended and marriage delayed until a true period of adolescence has become an almost universal phenomenon in American life.

Adolescence extends, roughly, from 13 years of age till 21 for girls and from 15 till 21 for boys. It is initiated by a short period of puberty, *but it continues for many years after the advent of sexual maturity.* Adolescent boys and girls have physical, emotional, social, and moral characteristics that mark them off from either children or adults. Typical adolescent growth, reactions, behavior, and attitudes will be presented in an effort to characterize the period.

I. PHYSICAL GROWTH

A. Growth in Height and Weight: Growth in height is rapid just before and during the early years of adolescence. For boys, height increases at an accelerated rate from 12½ through 14½, with additional smaller gains until 18, when adult height is usually reached. The greatest increases in weight for boys (since early childhood) are between the ages of 13 and 16. The gain of these three years is slightly more than that for the preceding five. The growth rates for girls show similar developments, except that the curve for height rises most sharply between 10½ and 14, while that for weight shows maximum development between 11½ and 14½. An increased growth rate in height is, for both sexes, a phenomenon of preadolescence and early adolescence. For the boys the gains in weight continue throughout adolescence, but for the girls weight is almost complete at 16. During childhood the average girl is a bit shorter than the average boy, but between the ages of 11 and 14 she is taller. She is

also a bit lighter than the average boy until her eleventh year, but heavier from then on until 14½. During or after their fourteenth year, boys suddenly shoot up and achieve both a greater average height and weight.

When longitudinal records* are classified according to the period during which growth is most rapid, it appears that those children who grow tall soonest tend to be taller at all ages and to have a slightly greater final height than those for whom the period of maximum growth comes later. The corresponding differences in weight are even more marked than those in height.

Individual growth curves demonstrate great variability both in size at any one age and in growth rate among children and adolescents. Thus one girl may be as tall at 10 as another at 17. One boy may grow rapidly from the start of adolescence, increase his rate after 15, and be still growing at 17, while another boy grows very rapidly from 14 to 16 and then stops altogether. It is rare for two children to show identical curves.

B. Growth in Strength: The increase in muscular strength is easily observable in both boys and girls, though more especially in boys—perhaps because they use their muscles more and are greatly concerned about achieving adequate muscular development. Further differences in strength between the sexes arise from the characteristic proportions of boys and girls, which give boys better leverage because of their wider shoulders, longer arms, and bigger hands. Strength is often measured by the amount of pressure one can exert by gripping something with his hands. Longitudinal results for both boys and girls show that at all ages boys are superior to girls, and that as they grow older their superiority increases. At age 11 the difference in strength between boys and girls is almost 4 kilograms of pressure, but by 17½ it has increased to 20 kilograms.

One investigator has followed the develop-

*Records compiled by measuring the same children year after year.

ment of children through the adolescent years by measuring each year the speed with which they could run, the height to which they could jump, the distance to which they could throw a ball, and the width of their broad jump. In all four forms of exercise the boys made marked improvement, but the girls ran more slowly and could broad jump a shorter distance as they grew older. Their ability to throw a ball and to jump upwards increased a little. At 13 years the inferiority of the girls was, respectively, on the four tests, one-fourth of a second in the dash, one-half an inch in the upward jump, two inches in the broad jump, and forty feet in the ball throw; 3 years later it was one and one-half seconds, four and one-half inches, two feet, and seventy-two feet, respectively.

C. Skeletal Growth: Investigators have traced development of skeletal structure by taking X-ray pictures of the wrist, hand, or leg bones. At birth there is no difference between the sexes, but by the time girls are four years old they are already nearly a year ahead of boys in skeletal age. At eight, they are a year and a half in advance; during adolescence they are two years ahead. At fourteen, a girl's bones are almost mature, and at seventeen they are entirely so. In infancy the size of the bones is about the same for both sexes. During childhood it is slightly more for girls, but after the age of fourteen the boys' bones become progressively larger than those of the girls. At maturity both sexes have equal development as regards density and hardness.

The teeth also have characteristic growth rates. The permanent teeth begin pushing out the baby teeth when a child is 5 or 6 years of age. From that time on until the early years of adolescence a child acquires one or two teeth each year. The average 13-year old has 26 or 27 of his 32 teeth. As in all kinds of physical development, the girls are in advance of the boys; their teeth erupt earlier, and at all ages they have a larger number. The second molars usually erupt at the beginning of adolescence and the third molars—or wisdom teeth—at some time after 17 years of age.

D. Growth in Bodily Proportions: The parts of the body grow at different rates and reach their maximum development at different times. The head, for instance, does the major part of its growing before birth. On the other hand, the long bones in the arms and legs are ex-

tremely short at birth, remain comparatively short during childhood, and then lengthen quickly just before or during adolescence. The trunk is relatively long at birth, but it lengthens slowly during childhood, and attains its final length only as adulthood approaches. These variations in growth rate give the baby, the child, the adolescent, and the adult their characteristic proportions.

The face also grows rapidly in the early years of adolescence. The nose and mouth widen, and the forehead grows in both height and width. The upper part of the face usually develops faster than the lower, and the jaw is commonly the last feature to attain its adult size and angle. While some faces grow quite regularly, others show more or less disproportion during adolescence.

Changes in the bones, muscles, and proportions of the body are among the clearest indications of oncoming adolescence. When a boy starts cutting his second molars, when his chest grows deep, his shoulders broad, his hands and feet big, his arms and legs long, and his features large, he is clearly an adolescent. When a girl shows the same changes—though the shoulder and chest developments are less marked—and in addition reveals a widening of the hips and a tenderness in the breasts, she too has entered adolescence.

E. Growth in Circulatory, Respiratory, Digestive, and Nervous Systems: Changes in both the size and the tonus of the arteries are reflected in the measurements of blood pressure. From late childhood to late adolescence the blood pressure rises from 80 millimeters at age 6 to 115 at 18½ for boys, and 105 at 19 for girls. In the preadolescent and early adolescent years girls show a rise up to 120, followed by a reduction in the next two years; boys show a similar phenomenon, only it takes place three years later than among the girls. From childhood through adolescence the pulse rate becomes gradually slower. The heart drives the blood with greater force but it does not beat as often.

During adolescence the lungs grow, keeping pace with the increased width and depth of the chest. This development can be traced by measurement of lung capacity. At all ages the average boy is superior to the average girl, but in childhood and early adolescence the difference is not great. From the age of 14 on, however,

the curve for girls falls farther and farther below that for boys, although both continue to rise.

During adolescence the organs of digestion undergo considerable growth. The stomach becomes longer and increases in capacity. Because of the rapid growth rate in the size of the body, the adolescent needs more nourishment than formerly, and because of the enlarged capacity of the stomach, he craves more food. The net result is usually a tremendous appetite for three or four years.

The number of different fibers in the nervous system is complete at birth, but not all neural functions are present at that time. There is almost no increase in the length, width, capacity, or weight of the brain during adolescence, because the brain has achieved its adult size in childhood. What growth there is, then, is confined to further development of the fibers, in both length and thickness, and to further contacts among them. Evidence seems to show that the complexity of the brain—that is, the total number of contacts between fibers—is increased somewhat during the early years of adolescence.

F. Glandular Development: Each endocrine gland has its own growth rates. The thymus develops rapidly in childhood; at thirteen it is 220 per cent heavier than at birth and 120 per cent heavier than in adult life. The thyroid, parathyroids, and pituitary develop at a fairly regular rate from birth to maturity. The pineal gland grows rapidly and reaches 90 per cent of its adult weight before a child is ten years old. The adrenals lose weight during the first year of life and do not regain their size at birth until the middle years of adolescence; thereafter, they increase quickly to their adult weight. The sex glands develop hardly at all during childhood; the ovaries have grown to 40 per cent of their adult weight by the time a girl is twelve, but the testes are still only 10 per cent of their final size when a boy is fourteen. The ovaries accelerate in growth somewhat from twelve to seventeen, when they are half their final weight; they then achieve the remaining half of their growth in the next three years. The testes grow rapidly for one year between fourteen and fifteen and then slowly. At twenty they have not yet attained their adult weight, although they have already developed their adult function.

Basal metabolism is the rate at which an organism is functioning. It is regulated by the thyroid gland. If an individual were exactly average, his rate would be measured as zero. When his bodily processes are accelerated, his rate is plus 1 or more; when they are retarded, it is minus 1 or more. In the preadolescent period—ages eleven to thirteen for girls and twelve to fifteen for boys—the rate rises from the customary zero to plus 13 or plus 14 and then sinks again. The rise for the girls is two years in advance of that for the boys, but is identical otherwise. Since the thyroid gland regulates metabolism, this temporary fluctuation means that the gland is unusually active for a brief time, probably because it is affected by maturation of the sex glands.

The maturing of the sex glands is the most important single development of the adolescent years. The mere physical ability to produce offspring is not, however, nearly as significant at the moment as the added depths and nuances of emotional life that develop along with physical puberty. The first point for consideration is the age at which maturity takes place. For girls the age can be determined with fair accuracy as being the time of the first menstrual period. With boys the determination is more difficult and must usually be estimated from the appearance of secondary sexual characteristics. There is a wide variation in the age of maturity. For girls this variation is from nine to eighteen years of age; for boys it is two years less—from ten to seventeen. Very few girls have matured before the youngest boy, but during the years from twelve through fourteen there are distinctly more mature girls than mature boys of the same age.

The age of menstruation is related to height, weight, and skeletal age. Those who mature earliest are, from early childhood, taller, heavier, and more advanced in skeletal development than those who mature later. Among boys the advent of puberty seems to accelerate growth in both height and weight, but for most girls, the onset of menstruation marks the end rather than the beginning of rapid growth. A similar relationship exists between the age of the first menstrual period and the development of the bones. Those girls who menstruate before twelve and a half are nearer to skeletal maturity than those whose first period is between twelve and a half and thirteen and a half, and

this latter group is in turn superior to those who first menstruate after thirteen and a half.

II. EMOTIONAL DEVELOPMENT

Emotions do not seem to change much throughout life as far as the inner feeling and the bodily changes are concerned, but there are many changes in the stimuli that produce emotion and the overt reactions that are made to one's emotional state. To illustrate the nature of these developments, with special stress upon the stimuli and reactions typical of adolescence, the three emotions about which most is known have been selected for study.

The first of these emotions is anger, which has been studied from early childhood to late adolescence. Small children become angry because someone tries to take a plaything away from them, because of some conflict arising over getting dressed and going to the toilet, or because of some interruption of their activities by others. For adolescents of both sexes the commonest causes of anger may be described as "social," especially for girls. In addition, boys become angry over the failure of some material object to function properly. The remaining causes of anger listed by the adolescents are of an impersonal nature, such as anger at the weather, at being hungry and not having time to eat, at having a headache on the day of an important examination, and so on. The reactions made when one is angry also show a development with age. The small baby screams and beats the air with his arms and legs. The preschool child also cries, screams, and becomes stiff; in addition, he kicks, strikes, bites, scratches, stamps his feet, jumps up and down, or throws himself on the floor. To a slight extent he scolds and talks back. By adolescence the response of talking has become by far the most important. Actual violence is reported in few instances, although there is frequent reference to the suppression of such behavior. Instead, the boy or girl tends to substitute the reactions of pacing the room, going out for a walk, or indulging in some violent exercise as a means of working off the emotion. Finally, there is a persistence of infantile behavior in the form of stamping the feet or kicking things on the part of the boys, and of crying, on the part of the girls. It should also be noted that the younger the individual the more immediate is the release of emotional tension. The dura-

tion of the anger also varies with the age of the individual. In the case of preschool children, anger lasts less than five minutes in 90 per cent of the cases. For college students the average period is fifteen minutes, and the total range varies from one minute to forty-eight hours.

The second emotion to be considered is fear. The common causes of fear, anxiety, or worry among children are: failing a test in school, father or mother being sick, father or mother working too hard, getting a bad report card, father losing his job, being late to school, being hurt by knives, guns, poison, fire, floods, or in an accident, holdup, burglary, or fight, being sick, suffering, choking, dying, losing money during an errand, losing one's fountain pen, losing one's friends.

High school pupils continue to show a few of the typical childhood fears, but new sources of worry appear. Adolescents concentrate upon fear of school examinations, automobile accidents, and disease; worry over inadequate funds, getting a job, loss of work by parents, or the appearance of the home; fear of being sinful, being led astray by bad companions, or being tempted to cheat; worry over being unsuccessful, over hurting other people's feelings, over making a bad impression upon others; fear of growing up, of social incompetence, of sexual experiences, of disappointing one's parents. It may be noticed that adolescent worries have their roots in social situations and are less numerous than those typical of childhood.

The reactions to fear are not varied. First there is a rigidity of the entire body and then a running-away. As children grow older and their intellectual abilities mature, they learn to do their running away before the stimulus appears; that is, they learn to avoid situations that may cause anxiety.

The third emotion to be presented is love. In psychological literature the person or thing that inspires the emotion of love has been termed the "love object." The love-objects that are most powerful vary with age, just as do the situations arousing either fear or anger. The first love-object for babies of either sex is undoubtedly the mother or the person who looks after them. Later on, the mother may be displaced by the father, by other adults, or—after school age—by a particular teacher. This fixation upon adults, often adults of the opposite

sex, continues normally until the middle years of childhood. Then, for a few years, children are usually more deeply attached to some other child of their own age and sex than they are to anyone else. These attachments are perfectly normal and are a necessary step in the gradual emancipation of a child from the emotional ties which bind him to his home. The period of devotion of boys to boys and girls to girls continues, usually becoming more intense, up to the years of adolescence.

The third and adolescent stage begins as soon as boys and girls select as a love-object an individual of approximately the same age but of the opposite sex. Usually the transfer from friends of one's own to members of the opposite sex is easy and natural. All that seems to be needed is the presence in the environment of a large number of possible love-objects. During the early and middle years of adolescence the constant falling in and out of love is entirely normal. By having many short periods of attachment to many different people, boys and girls gradually learn what kind of individual they really like best. Toward the end of adolescence or early in adult life there should be a narrowing of the field to one person of the opposite sex and of approximately the same age. Out of possible love-stimuli the young man or woman selects one as a permanent mate.

Within the past few years several investigators have worked out tests for measuring emotional maturity through the measurement of attitudes and interests. The results are expressed in terms of "emotional age," a concept exactly paralleling that of "mental age." An individual adolescent may be developing normally—that is, reacting to the usual stimuli for his age and sex—or he may be retarded emotionally—that is, he reacts to childish stimuli in a childish way—or he may be accelerated emotionally—that is, he responds only to adult stimuli and in an adult manner. People vary just as much in the rate of emotional as in the rate of physical growth.

III. SOCIAL DEVELOPMENTS

The adolescent years are, pre-eminently, a period of social development and adjustment. During these years, the boy or girl becomes acutely aware of social pressures and relationships. It is this sensitivity that leads the adolescent into the characteristic conformity of the

period. He wants to have the same kind of clothes, to use the same slang expressions, to do the same things, to study the same subjects in school, and to enjoy the same forms of amusement as his friends. Release from this social bondage to one's age-mates is achieved only slowly as the adolescent approaches adulthood.

A. Spontaneous Social Life: The typical social group during the adolescent years is the "crowd," which appears to be a tightly knit group of 6 to 10 or 12. The number of boys and girls is by preference exactly equal. The activities of these groups are difficult to list because the crowd seems to do practically nothing. In the summer it sits around on someone's porch, talks for hours, and makes occasional excursions to the neighborhood drugstore. In the winter it sits around in someone's house, plays the radio, and raids the icebox. None of this activity comes under the heading of adventure as seen through the eyes of childhood, but it is apparently exciting for the adolescent. It is adventure, not into the world of things but into the world of social relationships. It gives the participants an opportunity to develop their conversational powers and social skills on other people whose abilities are no better than their own.

The values obtained from such a crowd may be listed as follows: experience in getting along with other people, experience in social skills, development of loyalty to a group, practice in judging people, discovery of what they can and cannot do in the way of leadership, and experience in love-making under circumstances in which the participants are protected from serious consequences. The only negative training is the development of antagonism toward other crowds than that to which the individual belongs. For the most part, however, the crowd is a socially valuable unit of adolescent society and probably does more to bring about normal social growth than teachers and parents combined.

Normally, boys and girls develop many friendships with each other during the period of adolescence. These friendships are essential to normal adjustment. Nothing that results from them could possibly be as serious as their failure to develop. Aside from the emotional maturity reflected by the interest of boys and girls in each other, these friendships serve to give experience in courtship and to provide the

basis for subsequent ideals of mating and marriage. Far from being dangerous, the somewhat sentimental boy-and-girl attachments are highly educative at the time and are essential for self-protection in the years after home supervision has been left behind.

Both boys and girls show a definite evolution in their concepts of what constitutes desirable behavior. The preadolescent girl tends to idealize reactions that conform to the demands of adults—obedience, demureness, and docility. In early adolescence she exhibits behavior suggestive of an emotional disorganization: she makes exaggerated responses to stimuli—giggling over nothing, raving about this or that, and getting into moods of black despair. She has also a great interest in her own person and appearance. This stage is mercifully short, and presently—at about fifteen—the girls begin to put great value upon the typical boyish traits of activity and general noisiness. This stage also passes, and girls of sixteen are already accepting adult feminine patterns of behavior. Boys have a somewhat less complicated evolution of conduct. The twelve-year-old tries to emulate the hero who is daring, good at games, and a leader. He admires defiance of adult authority and regards neatness or obedience as signs of weakness. By fifteen he has changed somewhat. He still gets prestige from skill in games, and he admires aggressiveness and fearlessness; but he thinks defiance is immature and childish.

B. Homes for Adolescents: One major objective to be reached by the end of the adolescent period is the emancipation of the boy or girl from home control and from intense parental attachment. Between the ages of twelve and twenty an individual must change from a child who is dependent upon his home to an adult who is sufficiently detached from his parents to be able to establish a successful home of his own. The first need, then, in a home for those of adolescent age is a wise relinquishing of the strict control necessary for children and a wise development of adequate self-control in the adolescents themselves.

As children approach adolescence it is highly desirable that they be given an allowance, the amount of which is gradually increased so that from year to year they buy an increasing greater proportion of what they need. Naturally, some of the expenditures will be unwise, especially at first. However, one can learn to spend

money wisely and appropriately only by actually spending it.

An adolescent should choose his own friends. Naturally, he will make some undesirable acquaintances, but no serious harm is likely to come about unless the parents, by an uncompromising attitude, drive the adolescent out of his own home and force him to meet these undesirable individuals secretly. As in the case of spending money, a shifting of control from parent to child cannot take place overnight; but take place it must, sooner or later.

An adolescent needs a home in which the parents do not pass on to him their own maladjustments. Such conflict may be seen in its simplest form in the immigrant home, in which the parents are attempting to maintain their native customs in the face of American social forces. Many parents force their adolescent children to make decisions on exactly the same problems for which they themselves can find no solution.

A desirable home for adolescents offers them security. To be sure, the adolescent often goes along for weeks at a time without requiring other security than food and shelter, but when he gets into difficulties he needs a harmonious and sympathetic home quite as much as a small child does. As his independence increases, he falls back upon his home less and less frequently, but until he has set up a home of his own—and sometimes even later—there are sure to be occasions when he needs security above everything else.

As youngsters grow into adolescence parents should change the nature of the relationship between themselves and their children. The adolescent should emerge from the parent-and-child relationship and should gradually enter into the relationship of older and younger friends. This change will not often be made unless the parents take the initiative. Whether they intend to or not, parents serve as models, good or bad. From them and their attitudes toward each other a boy or girl gets his or her notions about home and life and marriage.

The desirable home for adolescent boys and girls has thus four characteristics: first, it allows its children to grow up; second, it does not pass on to them its own maladjustments to modern society; third, it provides a haven of emotional security in times of stress; and fourth, it serves as a model of what a home should be.

IV. MORAL DEVELOPMENT

This section will be short because relatively little research in this field has been done. Such data as are available will be presented under the headings of attitudes toward religion, growth in moral behavior, development of ideals, and need for a philosophy of life.

A. Attitudes toward Religion: For the most part, young adolescents accept whatever religious beliefs they have been taught, but even as early as the age of thirteen there may be some degree of doubt. The idea, popular in childhood, that one can get things by prayer has been largely outgrown, a few children are already questioning God's existence, and a considerable number have lost their confidence in God's omniscience and protection. The attitudes of older adolescents upon similar topics show in general an increased skepticism, although there are few who go so far as to become atheists. Church affiliation reduces the degree of skepticism and favors the acceptance of religious beliefs.

Various factors are more or less related to the development of religious beliefs. The relationship between chronological age and religious beliefs is negative. Girls usually revolt against accepted beliefs less frequently than boys, less profoundly, and at a later age. The correlation between the educational and economic level of homes and the acceptance of religious beliefs is also negative; that between belief and intelligence is either slightly negative or close to zero. The relation between acceptance of religious dogmas and religious observances in the home or attendance of the entire family at church is relatively high. With religious education or knowledge of the Bible there is no relation whatever.

As a teacher of ethics, the average church has undeniably lost ground within the last three generations, but it is still a dominant influence, even though church attendance decreases somewhat with age. At sixteen, 60 per cent of the boys and 65 per cent of the girls go to church once a week; only 11 per cent of the boys and 9 per cent of the girls never go. At twenty, one-fourth of the young men and over a third of the young women still go to church every week, while half the men and something over a third of the women attend church sometimes. No organization that has contacts with such a large

per cent of boys and girls from sixteen to twenty is a negligible factor in their lives.

B. Honesty: There has been a good deal of research into the actual behavior of children, in or out of school, as they reacted to situations in which they could be dishonest without apparent danger of being caught. Throughout childhood and early adolescence, a teacher can expect cheating in schoolwork from many pupils of average ability, from most dull pupils, and even from a few of the brightest children. In athletic contests and parties she is likely to observe dishonest behavior in some per cent between 30 and 50 of the pupils, without much respect to intelligence. She can expect greater dishonesty from retarded than from accelerated pupils and more from those who do poor work than from those whose work is satisfactory. If a given pupil's friends or siblings are known to be deceitful, she can anticipate dishonesty from the pupil concerned. She can also presume dishonest behavior in proportion to the amount of direct training in the particular situation being tested. Thus in a group of children of whom 80 per cent will peek through their fingers in order to trace a drawing more accurately, not more than 30 per cent will cheat in scoring their own papers, and not more than 3 per cent will steal money.

Cheating in schoolwork does not appreciably decrease as the pupils grow older, perhaps because there is always a group of pupils at the bottom of the class, no matter how much elimination has already taken place and the pressure upon them becomes greater with the passage of years. Failure in school is distressing enough to children, but it often means to the adolescent boy or girl a collapse of social as well as academic standing.

C. Development of Ideals: Since concepts grow out of experiences, the child with socially acceptable habits usually grows up into the adolescent with socially acceptable ideals. To be sure, the period of adolescence brings new experiences, and these will, in turn, lead to modifications. However, the essential connection between childhood experiences and adolescent ideals should not be forgotten. All ideals are generalizations of past experiences, used for the purpose of assaying present or future conduct.

Every normal adolescent has ideals, and he judges conduct in terms of them. It should not,

however, be supposed that all ideals are socially acceptable. The boy who sees in many diverse situations the ability of the strong to coerce the weak may develop the ideal that "might makes right." Such ideals have recently been developed much too completely by the youth of Europe. After developing this ideal, an adolescent may use it to guide his own conduct or as a basis for judging new situations. His generalization is just as truly an "ideal" as a conviction that the strong should protect the weak.

D. A Philosophy of Life: The modern adolescent wants to find a meaning to life, a synthesis of its discordant values, but certain elements in modern life make this effort especially difficult. First, he has from infancy been brought up on an objective, unemotional presentation of scientific facts. He usually knows just enough about science to block his acceptance of traditional religion but not enough to evolve a synthesis of science with religious and moral beliefs. Second, he is acquainted with many people, many customs, and many points of view. Third, he is met on all sides with the most divergent adult opinions. He sees no single, accepted mode of life, and he does not know what will satisfy his notions of right and wrong. Finally, he and his friends have extraordinary freedom from adult control. It is not surprising that the world seems chaotic and meaningless. Some adolescents find consolation in organized religion, but more of them have to work out their own salvation.

Young people want chiefly two things from their philosophy—a feeling of security that a rapidly changing society does not give them and an emotional satisfaction that is not provided by the scientific world around them. Modern science feeds the mind but not the imagination or the emotions. In their efforts to interpret the world so that it has a meaning for them, adolescents want not only a sense of personal security but also a stimulus to imagination and an opportunity for emotional thrill. In the course of time modern youth may work out a new synthesis of values that will almost certainly be independent of organized religion but probably will be an evaluation of human life in criteria that are social and ethical.

V. INTELLECTUAL GROWTH

Since the very earliest studies of adolescence, stress has been placed upon the characteristic

intellectual developments of the period. In life situations if not in test situations, there seems to be an increase in judgment, reasoning, comprehension, speed of performance, memory, concentration, or other mental functions.

A. Growth Rates: When one plots a curve for the mental growth of boys and girls who are re-examined yearly from early childhood to late adolescence, the curves are very nearly straight lines, the growth for all yearly intervals being almost equal. Children develop intellectually at a rate that is directly proportional to their initial capacity. The brighter a child is when he enters school the faster he will develop mentally, and the duller he is the slower he grows. As a result the bright and the dull become more and more unlike as they grow older, because the distance between them increases.

Specific tests show increases with age in various specific abilities. For instance, adolescent memory is better than that of childhood. This growth may, however, be obscured by a distaste for monotony, but if the material to be memorized is so presented as to seem a logical step in gaining a desired end, an adolescent can learn it more rapidly than a child. Ability to obtain insights, to judge, or to think increases by leaps and bounds during adolescence. Thus, the inadequate childish understanding of the parables in the New Testament shows a large increase between the ages of eleven and fourteen for the easier parables, and between eleven and eighteen for the harder ones. A similar rise is shown in the ability to interpret cartoons. There is some evidence of increases in imaginative power and in ability to concentrate.

B. Growth in Interests: During the adolescent years both boys and girls show characteristic developments in their interests in radio, movies, games, and reading.

Pupils above the primary grades listen to the radio from one to three hours per day. Boys at all ages like comedy best, then dance music, drama, and detective stories. Girls put drama first and comedy second, followed by specifically children's programs and dance music. Two-thirds of the children do other things while listening; they read, study, eat, play, or sew. Interest in dance music shows a considerable increase with age, while interest in children's programs declines. Children of all ages listen more or less to all kinds of programs,

their choice being apparently more influenced by the hour of a program than by its nature. In general, school pupils rate their interest in radio just behind their liking for the movies, ahead of their interest in the "funnies," and a good deal higher than their desire to read books.

Children like the same action and adventure in the movies that appeal to them in books. They are devoted to serials and love animated cartoons. At or even before puberty, girls begin to want love stories, and they soon develop a penchant for almost any story in which the scene is laid in a sumptuous house and the women wear lovely clothes. Boys are slower to forsake Western and gangster films, but eventually they too prefer love stories. Adolescent members of both sexes like humor—especially of the wisecracking variety, best typified by Charlie McCarthy—musical shows, and dancing. Newsreels are well liked by adolescents.

Perhaps the best way to see what effect movies have upon adolescents is to let them speak for themselves. Pupils report that they obtained help from the movies in selecting clothes, acquiring acceptable manners, developing better social adjustments, selecting love-making techniques, acquiring a philosophy of life, getting a better idea of modern society, developing ambition, realizing the value of family affection and loyalty, and developing religious and moral attitudes. Movies led them also into such emotional experiences as day-dreaming, terror, sorrow, romantic love, passionate love, grief, pathos, general tenseness and excitement, longing to be "good," and resentment at social discrimination or at family interference with adolescent ambitions. Adolescents may find dissatisfaction with their daily lives after observing life seen against a setting of luxury and freedom, and this dissatisfaction may take an acute expression in some form of rebellion against parental restraint. On the positive side, many high-school pupils develop a desire for travel and for further education, as a result of their attendance at the movies. In short, each adolescent finds in the movies the things he or she is interested in—excitement, romance, escape, knowledge, or training in social competence.

The three-year-old boy plays mostly alone and amuses himself with simple objects. The five-year-old plays with a ball and runs about in

active but unorganized games, such as tag. The older boy spins tops, plays marbles, or flies a kite. He also plays loosely-organized, group games that are elementary forms of those so popular in later years. The pre-adolescent boy usually prefers hiking, camping, and swimming to competitive games. In early and middle adolescence, the favorite activities are highly organized group games, played with established rules. By the age of twenty-one interest in games has become more passive than active, and already the average boy has begun to develop the attitude of the average man, who derives pleasure from watching sports rather than from active participation in them.

Among girls there are parallel developments. The little girl begins, as her brother does, by playing alone at such simple amusement as banging a pan with a spoon. By six, however, differences in interest between the sexes have begun to show. The six-year-old plays with her doll and also likes such group games as London Bridge, Farmer-in-the-Dell, or Drop-the-Handkerchief. The nine-year-old likes paper dolls and doll-houses; she serves "afternoon tea," she likes to "dress up," and she plays many active games such as run-sheep-run, or hare-and-hounds. At twelve her amusements are more like a boy's than they are earlier. Swimming, roller skating, and hiking are especially popular; so also is reading. By the age of fifteen practically all athletics are popular, and the average girl is more active in her amusements than she ever is again. Dances and parties vie with athletics, however. The eighteen-year-old is strongly social in her interests—dates, parties, and dances engage most of her attention. She still likes sports—swimming or skating, for example—but organized games do not interest her much any longer. She reads, sews, looks in the shop windows, and talks interminably over the telephone. At twenty-one she is even less active, although she develops some degree of spectator interest in active games, but her real diversions are social gatherings, reading, and above all the movies.

The child of either sex who can just barely read likes a small-sized book with many pictures and a story about animals or other children. In the elementary school years, boys like stories that deal with war, boy scouts, athletics, or strenuous adventure. In the preadolescent years many boys develop a craze for reading

an entire series of books, with themes of adventure and athletics. It is not until the later years of adolescence that the romantic novel makes an appeal to boys. Girls show a somewhat different development. During elementary school their interest is chiefly in fairy stories and tales of home or school life. With the beginning of adolescence, they become almost immediately interested in romantic literature. Most girls of thirteen are already reading love stories. They have also a devotion to the continued story in popular magazines and a more pronounced liking than boys for detective stories. Between the ages of 12 or 13 and 15 or 16 boys and girls are markedly unlike in their reading interests because most of the girls are already mature and like adult fiction, whereas the boys still cling to juvenile stories of adventure, athletic prowess, and financial success.

Adolescents thus show their intellectual development by general growth as measured by mental tests, in specific powers or abilities, and by the awakening or changing of interests. In all these lines they show an intellectual quickening and deepening that have always been regarded as an outstanding characteristic of the adolescent years.

Adolescence is, thus, a period of rapid growth in bodily development and of equally rapid change in emotional life, social adjustment, moral attitudes, and intellectual abilities. The boy or girl enters adolescence as a child and emerges, some six or eight years later, as a grown man or woman. Some adolescents pass through the period easily, some have frequent but not serious difficulties, and a few show a sort of emotional and social chaos. The nature of the period depends upon the kind of treatment received from age-mates and adults and upon the kind of adjustments to life already made by the end of childhood.

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AESTHETICS, PSYCHOLOGY OF.—To

the layman it appears obvious that aesthetic behavior is somehow unique. Studious attention to a textbook on calculus, the butchering of steers, or the tying of shoe strings would not generally be considered as aesthetic. But the reading of a favorite book of poems, the symbolic butchering of men on the stage, or the tying of flowers into garlands would probably

be judged worthy of the name, aesthetic behavior. At first glance the distinction may seem precise and clear. So the discovery that definitions of things aesthetic¹ are quite arbitrary and notoriously subjective of formulation will come, perhaps, as something of a shock to one who has not given the matter considerable thought. Moreover, as the anthropologists continue their work of studying the behaviors of the many peoples of the earth it is becoming increasingly certain that a definition of aesthetic behavior based on studies of a single age or culture is much too limited. We must, then, accept the idea that the aesthetic is a term which covers many divergent behaviors.

Aesthetic behavior is commonly said to be undertaken solely as an end in itself. It is often described as nonutilitarian or as playful behavior and as displaying psychical distance. Tied closely to it are empathic behavior and pleasure. Art is said to be the language of the emotions and always to show the working of some unifying principle. The psychologist, however, is not satisfied with these and the multitude of other criteria of the aesthetic, for he can envisage numerous difficulties in the use of any one of them. Well he knows that all humans, when queried, are prone to cover their real motives with a shell of rationalizations which may be difficult to crack. Artists and art audiences may indeed be motivated in large part by love of the art object itself. But, in addition, they may have cravings for fame, for financial reward, for prestige gained through first-nighting or through being known as art-lovers, for values which are surely not entirely in keeping with the notion that art is an end in itself.

An art object may be intended for use as a dwelling, as an office building, an altar or for some other utilitarian purpose. Now, does this practical, workaday function make it any less artistic? Men differ in the degree of psychical distance with which they view artistic creations. Yet is a man behaving more aesthetically because he views Rubens' "The Descent from the Cross" with more than average detachment? Or is the architect any less artistic because he understands better the structural possibilities of the spindly pillar and so fails to empathize² as does the layman who fears that the ceiling may collapse on his head at any moment?

¹ For this and following references see NOTES, p. 25.

It is a truism that what is pleasing to some may be displeasing to others. There are those of us who love Bruckner and there are the Bruckner haters. The architecture grandfather loved is "gingerbread" to his functionally minded grandson. Fechner's golden section has nowadays fallen slightly from favor (see page 26). These and other similar facts indicate that it is training which creates the settings in which pleasure and displeasure arise—training of one sort in Tibet and another in Portugal, of one type in the "Gay Nineties" and another in the same locale in 1945. The criterion of universal pleasure, then, has little value for our definition.

To say that art is the language of the emotions is to say little, for some of the arts have all the earmarks of true language while others scarcely resemble language at all. The African drum language and the mural tell specific stories. But the very essence of the more abstract arts rests in the fact that they serve as media which elicit a variety of mood and intellectual contents. These art objects have definite and restricted meanings only to the select few who are familiar with the thinking of their creators. At the most there is aroused in the uninitiated merely some commonality of mood. But the images these artistic creations elicit are personal, so personal in fact that these abstract forms can be employed by the psychologist as projective devices for the discovery of quirks of personality and for their alleviation.

The commonality of mood which music arouses appears to come from commonality of experience and also from the fact that "[auditory characters] merely *sound* the way moods *feel*."³ Hevner, after careful experimentation,⁴ has concluded that tempo is the most important factor in mood production, with modality second in importance. Pitch ranks third and harmony and rhythm trail. In poetry⁵ rhythm seems the most effective element in mood production with voice pattern second, consonant sounds third, and vowel sounds coming last in importance. While the other arts have not been so exhaustively studied (see page 19) some commonalities in mood have been found. So, the question, is art the language of the emotions, hinges on definitions; i.e., is the amount of agreement in mood so far discovered sufficient to satisfy the definitions both of language and emotion? The answer is most often "No."

The unity principle is almost universally reported as a criterion of the aesthetic. In listening to a melodic line we have the comfortable feeling that we know the general plan the composer is following. So it is with the painter with his principles of balance. We expect certain effects and if we are disappointed we attempt to learn the novel unifying scheme we feel the artist must have had in mind. But what is the origin of the unity? Does it always antedate human experience and exist as an objective entity or may it derive out of unrelated bits which become related simply from frequency of association? Suffice it to say here that the relatively new in the arts is rarely seen at first as unified. This satisfying feeling of "being in the know," of recognizing a unifying principle, comes only through formal or informal training. As a criterion it is almost valueless as other behaviors show unity also. And to call all of these "aesthetic" would so broaden the term as to make it all-embracing and so relatively meaningless.

It is currently the style to define phenomena operationally, i.e., in terms of what is occurring. According to this way of thinking aesthetic behavior must be defined in terms of what artists and art audiences are actually doing. Hence, the nature of the aesthetic should become increasingly clear as the discussions of this section continue. At any rate we must not be alarmed to find that the aesthetic and the non-aesthetic cannot always be convincingly separated. After all, these terms represent but the extremes of a continuum and differ only in degree. So, when we come upon a behavior that meets a number of the criteria discussed above we shall probably term it aesthetic. In any event we shall find it worthy of study just as we shall certain other behaviors which satisfy fewer of the alleged criteria.

AESTHETIC MOTIVES

When called upon to explain aesthetic behavior there are those for whom the positing of an instinct is attractive. Yet instinctive drives in man cannot be observed. As they are merely inferred their explanatory value is decidedly limited. The weakness inherent in this type of doctrine is particularly well demonstrated in the claims of the psychoanalysts. Freud⁶ has taken as a causal factor the sex instinct. Art behaviors generally are held by him to be

linked to sex. This drive is not expressed in its natural form but rather as a sublimation; it wears a socially acceptable garb. The artist's predilection for the painting of cathedral doors is an expression of sublimated sex, for doors are female sex symbols. And how does Freud know that they possess such symbolic potency? The rules of symbolism, says Freud, have been established through the psychoanalyzing of many thousands of patients.

The answer to the Freudian declaration is that not all his rules have scientific validity. Freud's subjects are unaware of the "meaning" of their thoughts and actions until they are put through a period of indoctrination, i.e., until they are psychoanalyzed. Were they to fall into the hands of a rival analyst their indoctrination would be along different lines and the "meanings" would be different. The notion that Freudian symbols have universal meaning is utter nonsense. There is no proof, then, that all aesthetic motivation is of sexual origin. There are situations,⁷ of course, where the sex motive is obvious. But even here, sex is only one of a number of interacting variables.

The best known tenet of Adlerianism⁸ is the principle which labels the mechanism of overcompensation as the chief source from which motives arise. The overcompensation may be in the area of the defect or in some other field of endeavor. It is the former type of overcompensation which bears particular reference to artistic abilities. Those of us who are endowed with inferior auditory equipment, says Adler, are likely to become musicians; others of us, cursed with color weakness, become for the very reason of this defect, painters. In his writings and speeches Adler has presented corroborative evidence for these claims, but, unfortunately, it is anecdotal in character. Typical of it is the case of Beethoven's deafness. Now this progressive trouble may well have done much to motivate Beethoven musically. But we must remember that Beethoven was musical long before he was deaf. What experimental evidence⁹ the literature yields on defects—and it is scanty indeed—does not bear out Adler's declarations.

We have seen the analysts link aesthetic motivation to sex and to organic weaknesses. Others, while not embracing psychoanalysis, agree with Freud to the extent of assuming that the male sex glands furnish the motivating

forces for artistic endeavor. How else, they ask, can the relative absence of female geniuses be explained? Theorists who argue in this vein ignore the phenomena of social history. To this day the two sexes have not been given equal opportunity or equal pressure to achieve in the world of arts. Until very recently the woman writer was even forced to adopt a male pseudonym to obtain a reading audience. So, it should be obvious that no clearcut answer can be had until the sexes are treated more similarly and are given equally potent reasons for seeking careers.

The advent of the Nazi movement has caused an intensification of the belief that each race has unique motivational resources which make its members peculiarly successful in certain types of activity. The proponents of this view have not bothered to indicate the sources of these motivational differences except to assume that they are somehow linked to biological structures. Neither have they worried over their numerous and contradictory uses of the term "race."

Racists who consider themselves "Nordics" have staked claims for their superiority in most creative lines. But because aesthetic achievement of a non-literary sort has probably never been regarded by them as highly as has great accomplishment along literary lines they are often willing to grant to the "Alpine," the "Mediterranean" and even to the Semitic peoples preeminence in the other arts. Of course they fail to note that careers in music and painting are often among the few open to "inferior" groups.

With the advent of tests of artistic talent there arose the hope that racial differences could be analyzed in a truly scientific manner. Unfortunately, this hope has not been realized. Mental tests, whether they measure IQ's, or "talent" in one of the several arts, cannot transcend the particular cultures in which they have been standardized. Within a culture, test differences among the "racial" subgroups are slight at best. Intragroup differences are far more striking than the intergroup. Hence, to state a person's "race" is to say nothing important about his artistic potentialities.

It has been held by some writers that the genius is a psychopathic sort of person who derives his motivations from his maladjustments. Adjust him perfectly, and, presto, he will lose

all drive toward creativity. It goes without saying that this blissful state of perfect adjustment has never been adequately defined, much less reached. So we must limit our discussion to the more obvious degrees of maladjustment.

The few data so far assembled would seem to show that the artistic are no oftener psychotic than are their less artistic fellows. However, common observation might lead us to suspect that the artistic are more commonly psychoneurotic. Such may indeed be the case. Yet granting the possibility, we would still need to know whether the psychoneurosis tends to precede or follow the artistic drive. The phenomenon of "artistic license" and the beliefs of many onlookers that "all artists are somewhat crazy" may in themselves have considerable potency in forcing oddity in behavior. At any rate the issue is too unclear to warrant further comment.

Strange but much believed are a number of statements concerning relationships between aesthetic abilities and physical characters. It is said that pointed or angular ears are "un-musical" as sound is curvilinear. Players of certain wind instruments allegedly possess extremely even front teeth. While almost all trombonists are bald, pianists tend to be blessed with a wealth of hair. The fingers of violinists (as well as thieves and surgeons) are longer and narrower than those of the average man. Such statements can be matched for the other arts. Yet even if they were to be substantiated, which the majority have not been, they would yield data of little worth on the motivational issue. We should still wish to know how the possession of long fingers forces one to take up the fiddle, or the blessing of regular teeth a wind instrument.

So far we have discussed alleged secondary motivational factors which probably no one would consider to be the most basic. Usually there is made the added assumption that he who achieves in the arts has been blessed with a particular genetic structure. It has even been assumed that the several artistic capacities are inherited as dominant factors. For proof of these genetic theories recourse is usually had to the analysis of family lines. The Bach family has been followed from generation to generation with only the ambiguous finding that for a time the number of musicians from generation to generation increased and then decreased.

But was the ultimate total eclipse of this great Bach family due to unfortunate marriages, to the changing socio-economic conditions of Germany or to a combination of these factors? It would seem obvious that the reasons for the fluctuation in the number of the artistically brilliant can never be learned by the techniques of genealogical research.

The difficulty with genealogical research rests in part on the faulty conception of heredity accepted by these family analysts. Happily, at the present time there appears to be a growing tendency to regard nature and nurture not as two mutually exclusive forces but rather as interweaving variables, each meaningless without the other. We see before us artists who seem to have emerged from most unpromising environments. We note that others with perhaps equally "good genes" may find such "bad" surroundings a complete block to all creativity. But we cannot be certain that such observations are sound until we get better tools for studying the stimulating character of our myriads of environments.

We have seen that little or nothing is known about man's artistic inheritance. We have reviewed certain of the alleged secondary sources of motivation and have found a rather similar state of ignorance. And now it must be admitted that little more is known of man's cultural motivations. Yet common observation tells us that they are powerful and that they affect men's responses to the last detail. Parental proddings, praise received at school, the desire to follow in the footsteps of some beloved model, or the opportunity to excel his fellows, may furnish just the stimulation necessary to start a youth into a career in the arts. Social proddings can, superficially at least, be analyzed further. A mother may force her son to take lessons on the violin because she has longed for lessons herself. A father may desire his daughter to be socially attractive and feel that the possession of art skills will aid in furthering this aim. Many of us have listened to our first chamber music because "it was the thing to do." Later on, after much suffering, we have found delight in the music itself.

The analyses of environmental motivations can be pushed further and further back. Why has the mother longed to take music lessons? Perhaps she has seen in the lesson a chance to push herself ahead socially, to break the routine

of housework, or to make herself feel that she is doing something worth while. But why does she wish to succeed socially, to avoid routine, or to do something worth while? To answer these questions the analyses must go ever deeper into the structure of the mores. Presumably every motivation is socially determined by thousands of interacting variables. To give any more than a superficial social history of any motive would necessitate a stupendous amount of probing into the history of the individual. Even then, all of the necessary information could probably never be obtained.

Life is filled with conflicts. We push on in one field and succumb to the adverse pressures of other fields. The artist is one who has developed a proficiency in color, line, tone or in some other art medium. His audience may listen to or view his works without sensing the motives behind their creation. Each artist's motivations may be quite different from those of his brother. And to learn why a particular person is motivated to view a painting or to listen to a piece of music demands the same type of detailed analysis of the individual's personal and social background found necessary in analyzing the motivations of the creator of the art work. The answers to the question of artistic motivation, thus, must be sought in the workings of social and clinical psychology.

ART STANDARDS

The belief that certain art objects are inherently good and that others are naturally bad is apt to strike the layman as sound common sense. The view which opposes this absolutist notion, the relativistic, considers beauty to be a function of the relationship between object and percipient, with the relationship varying from time to time and from place to place. It is claimed by the relativists that the changes in art tastes, recorded by the historians, could not have occurred if standards were absolute. They point also to the undeniable fact that the absolutists are invariably ambiguous in their descriptions of art principles. Indeed, their absolutes have become a veritable Holy Grail, ever sought but never found. The absolutists concede that history discloses apparent changes in standards, but maintain that men are still groping after the absolutes, and, in so doing, discard from time to time their false standards. The absolutists' criteria of "goodness" are not

always limited to the qualities of the art object but may also include the motives of the creator of the art object.

Quite typical of the attempts to assemble criteria is that of Howes¹⁰ who has offered as distinguishing marks of "bad" art: lack of sincerity, shallowness, self-deception of the real nature of the emotion, sentimentality, unconscious abandonment of restraint, and the use of the cliché. This list, it must be admitted, looks impressive. But bold, indeed, is he who would offer to separate any one of these criteria from its subjective covering and put it into scientific terms. If a man cannot always be certain of his own motives how well can he judge the sincerity or the self-deception of an artist, particularly if the latter has been long dead or is from another culture? Almost identical condemnations hold for shallowness and for the other criteria except the cliché. And, after all, why should we worry over the mental workings of the creator of the art object if it is the creation to which we are supposedly reacting?

The cliché, by its very definition, is an experiential affair. No artistic fragment can become hackneyed except through use. An element of art is ever fresh to the uninitiated while at the same time, perhaps, it is a cliché to the sophisticate. A musical phrase may seem novel at one period, a cliché at another, and again novel at a still later period. Thus, if an art element can be both good and bad at the same time the criterion of the cliché can hardly serve the purpose of the absolutists.

At first glance C. E. Seashore's definition of beauty as "artistic deviation from the rigid"¹¹ might seem to supply an objective criterion. The painter never paints with photographic accuracy. The vocalist and the violinist have their vibrato. And much the same situation occurs in the other arts. Mechanically perfect creations and renditions are frowned upon. A consideration of the issue, however, will show that the term "artistic" expresses an unknown quantity. The analyses of musical performances that Seashore and his colleagues have made, splendid and important as they are, can do no more than point out current practices, and, to a lesser extent, what were the practices as far back as phonographic recordings are available. They cannot disclose absolutes.

Katz, Gordon¹² and a number of other ex-

perimenters have done worth-while analyses of pooled judgments (see page 24). When two or more large groups of subjects with comparable cultural backgrounds are asked to rate the "goodness" of art objects with which they are reasonably familiar the group judgments will agree extremely well. Picked at random, person A may disagree violently with individual B. Yet the composite or pooled rank values voted by any one group of subjects will correlate very well with rank values given by the other groups. It should not be thought that the pooling technique discloses absolutes. Although certain theorists (but not Gordon) have assumed that such is the case it should be obvious that in almost any art field pools taken a century apart may agree only in slight degree. Pooling procedures simply bring out the contemporary cultural commonalities.

What has been taken by some as an attempt to describe absolutes can be seen in Birkhoff's¹³ *aesthetic measure, M*, which is regarded as a function of *O* (order or unity) and *C* (complexity or variety). In finding *M*, short work is made of *C* which is rather simply and arbitrarily defined. *O*, however, is split into a number of subfactors whose weights are frequently very difficult to figure with the aid of the Birkhoff rules. As Birkhoff admits that *O* and *C* represent social values he himself is not an absolutist.

A number of experimenters¹⁴ have attempted to check Birkhoff's values against others obtained directly from group preferences. Just what the moderate correlations which are usually found indicate is not entirely clear. But since Birkhoff must have followed the professional theorists rather closely in formulating his rules it can be guessed that the rather mediocre relationships so far obtained indicate merely the expected lag between present preferences and the views of the (usually) long deceased art and music theorists who have formulated our traditional rules.

From time to time since early days the idea has been expressed that a geometrical analysis of any visual art sample will disclose the reasons for its lasting beauty. It is sometimes assumed that the viewer perceives, consciously or unconsciously, the geometrical relationships involved, e.g., the squares and root rectangles found in the dimensions of the Parthenon. Many art objects are admittedly symmetrical in a static

sense. Others are said to possess a more dynamic type of symmetry. R. M. Ogden¹⁵ has seen in this naïve geometry of symmetry a mechanism by which he could link the gestalt doctrine of organized or symmetrical wholes to the beauty of art. He says: "While strict adherence to either static or dynamic symmetry is not called for, one or the other of these principles must be followed; otherwise, the parts will not find their due places within the whole, and the appearance of the whole will not be that of a harmonious arrangement of parts" (p. 201).

G. T. Fechner,¹⁶ often termed the founder of experimental aesthetics, can with considerable accuracy be termed an absolutist. By laborious tests Fechner reached the conclusion that one unique arrangement of parts was, aesthetically speaking, the best. This he termed the golden section.¹⁷ Fechner saw the golden section as the preferred shape for rectangles and as the most pleasing division point of a line, e.g., where the arms of the cross cut the staff. But whether or not the principles of symmetry and the golden section are innately perceived as "proper" it should be noted that present-day preferences are not always what the absolutists might anticipate. This is especially true of the golden section which, while reasonably well liked, often falls well below first place in a preference series.

One attack on the universality of art standards might conceivably be launched through a study of the "lasting quality" of artists and art objects. Any such genetic study¹⁸ will show that many men, like J. S. Bach, were practically neglected in their own time but achieved fame at some later date. Others, once famous, had in store for them a toboggan-like slide in popularity. Rossini comes to mind in this connection. Still others, like Beethoven, early achieved an acclaim which has lasted to our day. Experimenters¹⁹ have tried to telescope history by repeating over and over again a few musical compositions ad nauseam. The effects were as anticipated. Extremely simple compositions and those composed largely of clichés wore down the listeners faster than did those whose structures showed more complexity and novelty. But, repeated many, many times a day, even the latter compositions wore out their welcome. Here, then, is a point worth noting. Artists whose productions offer us too little in the way of complexity and novelty are not so likely

to remain as eminent as are their somewhat more original colleagues.

In this section we have oversimplified the position most theorists take on the question of absolutes. Few nowadays hold to one hundred per cent absolutes and no theorist can help making some value judgments. A sensible mid-position is that offered by Chandler²⁰ who holds that "the consensus of apparently cultivated persons throughout many generations will approximately represent humanity at its best and therefore be approximately objective" (p. 635). The Chandler view would cover the idea that a given art object can be the "best" of its particular school. For just as soup is desired early in the meal but not at dessert time and can be voted by soup lovers as good or bad, so hot jazz and Bach's counterpoint serve us differently as they follow or break the socially agreed-upon rules of their respective schools; yet specimens of each can be rated as good or bad. Bach's Concerto in D Minor is, in an absolute sense, no better nor worse than jazz. It is not a rival of jazz but it is on a different continuum altogether. The effect of a Bach composition on our musical lives is so much more lasting we term it "serious" music and pay it far more attention in our histories of music than we do jazz. But Bach would serve but poorly wherever jazz now reigns supreme.

TESTS IN AESTHETICS

The tests employed in the arts can be roughly divided into taste, "capacity," interest and attitude, and achievement, with some few classified into more than one of these categories. While the vast majority have reliabilities which are adequate for group work their validities have often been questioned.

Typical of the taste tests in the music field is the Hevner-Landsbury.²¹ Musical phrases in pairs are presented to the subject who must decide which pair member is "more pleasing, more appropriate, more musical." The Meier,²² a good sample of the taste tests in the field of painting, is constructed on a somewhat similar plan. The field of literature also has a number of taste tests built along this general line.

The "capacity" tests may be comparative or analytic in type. The drawing scales²³ are representative of the former; many drawings, after having been evaluated by experts, are arranged in the form of a scale and are given values.

The handiwork of the person to be tested is compared with the specimens of the scale and is assigned the scale value of the specimen it most resembles.

Behind the construction of the analytic tests is the much-disputed philosophy which holds that an art area can be broken down into fragments each to be tested without much relation to the others. The best-known tests to emerge out of this philosophy are the Seashore Measures of Musical Talents²⁴ which test in the fields of pitch, time, loudness, rhythm and timbre differences as well as tonal memory. The Seashore measures have proved of greatest value in the sifting of those people who will benefit least from training in music. The Seashore battery has several rivals, some of which test in the same areas while others measure such matters as tonal sequence, absolute pitch, interval recognition, etc.

The Study of Values²⁵ is a test which differentiates between six interest types of which one is the aesthetic. As might be anticipated, artists and musicians tend to make their highest scores in this interest type. Best known, perhaps, of the interest measures is the Strong Vocational Interest Test²⁶ which yields occupational scores which can be compared with those made by musicians, artists, architects, and author-journalists. What the Strong test does, in effect, is to compare the subject's interests with those of some two hundred or more members of each of these artistic professions. Assuming proper ability and training, the tester attempts to appraise the community of interest between the man tested and the members of these several occupations. Another approach to the testing of interests and attitudes is through the rating and formal attitude scales. The best-known aesthetic test in this category is the Hevner-Seashore²⁷ which measures attitude toward music with a formal-attitude scale built somewhat along lines of the now popular Thurstone-style test.

The numerous achievement tests now on the market resemble in all essential details the tests of accomplishment found in the other disciplines. Typical is the Kwalwasser-Ruch Test of Musical Accomplishment²⁸ for use in grades 4 through 12. This test has sections devoted to knowledge of musical symbols and terms, time and key signatures, note and rest values, to recognition of syllable and pitch names, and

familiar melodies from notation; and to detection of pitch and time errors in familiar melodies. There are also available standardized tests in which the subject is rated on the quality of his artistic performance.²⁹

It is clear that the aesthetic tests are, in the main, measuring variables which do not overlap greatly with academic intelligence. So, it is often the practice to add an intelligence test to a battery of art or music tests to facilitate the work of forecasting. Naturally, this would not be done were it not for the evidence that better than average intelligence is needed for success in aesthetic endeavor. Meier,³⁰ who has done fundamental work in the psychology of art, makes intelligence one of his six essential factors to creativity, the others being: energy output and perseverance, manual skill, perceptual facility, creative imagination, and aesthetic judgment. (The last-mentioned factor is measured by the Meier test mentioned above.) Of course anecdotes can be heard which tell of idiot savants who have done work of excellent grade in some one of the arts. But when these stories have been checked it is usually found that the so-called idiot savants either have no real ability or are psychopathic rather than feeble-minded.

LINKAGES IN THE ARTS

The stereotype of the artist is sometimes said to be that of a man with abilities so narrow that he can achieve in only one field of endeavor. The true picture, however, seems quite different with versatility rather than narrow channeling of interests and abilities the rule. The literature provides striking examples of men eminent in several art fields and of geniuses who obviously possessed the potentialities for great achievement in many lines of endeavor. But while many of the arts call for somewhat similar interests and abilities, music does not demand interests at all like those of its sister arts, if we can take the Strong interest patterns at face value.³¹ The interest profile of the musician is so different from that obtained from men in any of the other artistic occupations that it is usually not placed in the art category when professional groupings are made. Common observation seems to substantiate this finding.

A number of artists who hold that the arts are all basically one point to the phenomenon of chromesthesia or color-linkage to prove their

contentions. As one stage artist remarked to the author: "I never worry about the rules of color harmony. As I know what colors and tones are linked I merely translate the consonances of music into color and thus have answers which just can't be wrong." This craftsman was only temporarily dismayed to learn that his particular color-tone linkages were not shared by all other chromesthetic individuals. Like many others in similar situations he assumed that his alone were the "proper" linkages. Unfortunately for science, he and his fellows can rarely recall just when these conditionings—if they are conditionings—were formed. The dearth of information as to the origins of chromesthesia and the fact that the creation of extreme chromesthesia in the laboratory has so far proved impossible have led certain theorists to set up neural irradiation and other biological notions as rivals to the association hypothesis. A majority of the population have slight color-tone or tone-form associations.³² Ordinarily, however, the terms chromesthesia and synesthesia are reserved for the relatively small number of cases in which the images are of almost hallucinatory intensity. But neither the existence of an occasional chromesthetic nor that of the more common "visual-auditory associator" proves that there is an innate linkage between the auditory and visual arts.

TYPICAL EXPERIMENTAL DATA FROM THE MUSICAL ARTS

Vibrato. Contrary to popular belief, professional musicians only rarely render steady vocal tones. In about 95 per cent of the tones the pitch wavers up and down in a regular fashion. The range of each oscillation is from three-tenths of a tone to a little over a tone with the average at half a tone. The number of pulsations a second is approximately six. The string vibrato tends to be one pulsation a second greater, on the average, but spreads over only about a quarter tone. There are also intensity and timbre pulsations in both voice and strings and some vibrato in tones given off by other sorts of musical instruments. The vibrato³³ is usually considered to be the most useful of all musical ornaments.

Rhythms. Because of the relative absence of five- and seven-point rhythms in occidental music it has been popular to suppose that nature had endowed man with the capacity to

handle only two- and three-point rhythms and others based on these less complicated types. This view, however, is anthropologically naïve, as there can be found in the Orient many examples of five- and seven-point rhythms. Moreover, Max Meyer³⁴ has shown that occidentals too can achieve proficiency in what to them are the rarer rhythms. Meyer trained subjects in a laboratory to tap these rhythms by striking a baton against a series of buttons arranged in a wooden frame. With a training period of five minutes a day for four weeks his subjects reached a level of facility about equal to what they had previously had for two- and three-point rhythms. These and other experiments on cross rhythms indicate that the occidental musician has many rhythmic resources he has not so far exploited.

Damper-Pedalling. The reproducing piano such as the Duo-Art furnishes the researcher in aesthetics with a type of apparatus by which he can study the piano performances of the leading virtuosos. The player-piano is particularly useful when the idiosyncrasies of different performers playing the same composition are to be scrutinized. One of the pioneers in piano-roll analysis, C. P. Heinlein,³⁵ has found that there is surprisingly little agreement among leading pianists on the proper uses of damper-pedal patterns. This lack of agreement is reflected in the fact that a number of different patterns are generally acceptable in the performance of any given musical composition. It is well that this is true, for no professional pianist whom Heinlein studied was able to duplicate the pedal performance he himself had made ten minutes earlier. In fact, so little formal attention is currently paid to foot action by teachers of the piano that even the musically trained are apt to conceive damper-pedal differences primarily as differences in finger action on the keys. Schooled in the notion that all dynamics come from key action, they do not visualize the real role of the feet in piano performance.

Baton Movements. In our discussion of the vibrato we called attention to the fact that many teachers consider the "good" tone to be steady while in reality it is a "wobble." A study by Bartholomew³⁶ has shown a somewhat similar misconception in respect to baton movements. The textbook diagrams show a preponderance of straight-line motions and periods of relative rest at the beat-instants. To verify these rules

Bartholomew attached a tiny lamp to the end of a baton so wired that the light dimmed at the exact instant of the beat. The path of light was then photographed by a time exposure in a dark room. In his analysis of the baton movements of conductors Bartholomew found curvilinear rather than straight-line motions and points of rest closer to the "ands" after the respective beats. The fastest speeds were often at the beat-instants. In $\frac{4}{4}$ time the second, third and fourth beats tended to occur at troughs before the sides or top of the arm sweep was reached. Here, then, is an illustration of lack of realism in music education.

Industrial Music. More and more music is coming to be a part of the environment of the manual worker in the factory. Although it is difficult to prove that music directly raises production, it does appear to lift morale, if properly handled, and so, without a doubt, has valuable indirect effects. But not all types of music are liked equally well by the doer of repetitive work. Popular music of the hit-parade sort seems to be the most preferred with patriotic, Hawaiian and waltzes also well liked. "Semi-classical" comes well down the list of preferences, "classical" falls even lower and the blues come last in preference. There is now a special attitude scale available for the measurement of the musical preferences of industrial workers.³⁷

Improvability of Pitch Discrimination. Only a relatively few years ago children who could not carry tunes were common in the early grades. These monotones, as they were called, were usually boys and were assumed to be suffering from structural defects. But since that time a reevaluation of the arts in the school curriculum has led to better motivational devices. Hence, the boys of today more generally learn the concept of pitch, and monotones have become almost totally extinct.

While willing now to grant educability to monotones many testers are still loath to believe that adults with "reasonably poor ears for pitch" may be given better abilities through training. Nevertheless the task of proving that improvements are possible has been attempted by Wyatt³⁸ whose 16 subjects tested "low average" on the revised Seashore "Pitch Discrimination B" test (see page 18) and "poorly" on a specially devised pitch test. Wyatt gave her subjects 16 hours of training (one hour a week) in the discrimination of oscillator tones (500

cycles) and in vocal intonation with the aid of a stroboscope. At the end of the study the subjects averaged between "good" and "excellent" on the Seashore test. Moreover the training was found to be effective for other sources of sound and to have transferred to other frequency levels. Thus it would seem that our tested "capacities" are not unchangeable and so could better be termed "abilities."

Occupational Conditioning of Preferred Auditory Tempo. It is one thing to know that preferences are not chance affairs and another to demonstrate the reason why an item is liked or disliked. All too often we have no explanation to offer for some marked preference. But in the realm of tempo Foley³⁹ has shown certain occupational factors to be important enough to produce large affective differences between groups.

Foley secured as subjects 684 vocational-high school girls each of whom was enrolled in one of five occupational curricula. These girls were presented with six different metronome speeds ranging from largo (56 beats a minute) through larghetto (84), adagio (112), andante (138), and allegro (168) to presto (200), and were asked for their preferences. Members of the groups whose occupations involved loud, rapid and repetitive noises preferred rapid tempos—typewriting, 178.08 beats a minute; power-machine operating, 161.02. The girls whose occupations did not offer rapid auditory stimuli preferred slower rates—beauty culture, 139.04; dressmaking, 134.46; domestic, 133.61. Of the ten comparisons possible between the five occupational groups, seven showed critical ratios larger than 3.00. Here, then, is a clear demonstration of different environments making for dissimilar preferences.

Factorial Studies. It is currently popular in psychology to factor analyze data, to resolve numerous descriptive variables into smaller numbers of factors which are assumed to convey all the essential information of the original variables. Two attempts at factoring have been made with tests of music ability. In one study by Drake⁴⁰ eight commonly used tests were given to 163 "unmusical" boys. The data were treated by the Spearman tetrad-difference technique. While a common factor—possibly memory for auditory items, or ear-mindedness—seemed to be shared by all the tests there was found to be far more not shared than shared.

Drake also found five group factors which were difficult to identify psychologically.

Karlin⁴¹ used some of the same tests in his analysis, and, in addition, age and tests of intelligence and visual memory. The data from his 200 high-school subjects were analyzed to nine factors by a modification of the centroid scheme with rotation to an oblique simple structure. These group factors were tentatively termed auditory resistance, speed of closure, auditory span formation, memory span, auditory integral for perceptual mass, pitch-quality discrimination, loudness discrimination, memory or incidental closure, and an unidentified residual plane. However, not all of these factors were important for the music tests taken alone. When both the Drake and the Karlin data were considered together Karlin felt that three factors seemed indicated: a pitch or tonal sensitivity factor, a memory factor for remembering musical passages as a whole, and another memory factor for recalling isolated musical elements. Such analyses of course need to be verified by further work. Yet it is interesting to note that no all-embracing general factor was found which could be considered as paralleling a single musical ability.

Key Effects. The anecdotal literature has many references to musicians who have claimed to perceive key differences over and above differences in pitch. Thus E \flat minor has been held to be the most sombre key of all, G major to give the effect of quiet love, A \flat major that of dreamy expression, E major the most joy, etc. While somewhat questioning the reality of these effects the great Helmholtz⁴² considered the possibility that the differential striking of the black and white digitals of the piano could conceivably be responsible for the uniqueness of the key qualities. Rigg,⁴³ a modern investigator of music-caused moods, subjected 84 college subjects to five musical phrases each in five different registers. He found that shifts upwards of an octave, and sometimes of approximately half an octave, made the mood effects more joyful. But key changes of a tone or a half step up or down yielded no consistent mood changes. Apparently we ordinary mortals do not sense the striking key qualities the musically elite of the past have claimed to experience.

Ocular Behavior in Reading Music. Adequate instruments are now available by which the

movements of the eye during word reading can be studied. These devices have been adapted by Jacobsen,⁴⁴ Weaver⁴⁵ and others for use in the study of the reading of music, a type of reading in which vertical as well as horizontal movements must be measured. In the Weaver experiments photographic records of the eye movements were synchronized to records of performance on the piano keyboard to make possible determinations of eye-hand span. Conservatory students were given three selections of eight measures each to read—one, a hymn; another, a two-part Bach minuet; and the third, a single melody with supporting chords.

Among the many findings the following are of particular interest. The average number of notes played per reading pause was between one and two; the pauses lasted between .27 and .53 sec.,—longer than for word reading. Chords were not always read at one glance. Rather, the treble parts tended to be read before the corresponding bass portions. It was found that the eye-hand span was quite variable with never more than eight successive notes or chords between eye and hand. Although there tended to be two styles of reading—"a regular alternation of almost vertical movements of the eyes from one half of the staff to the other half and frequent horizontal movements on one half of the staff with relatively few movements between the two halves of the staff" (p. 28)—there seemed to be no basis for distinguishing types of readers. Weaver favors the "horizontal" form of reading.

TYPICAL EXPERIMENTAL DATA FROM THE OTHER ARTS

Ocular Behavior and Pictorial Balance. At the turn of the century Stratton⁴⁶ demonstrated that in the viewing of a serpentine line the eyes do not follow the curve smoothly, as introspection would suggest, but move rather in an irregular pattern. Feeling that the art experts might be equally in error when they consider pictorial balance a matter of eye pauses, Langford⁴⁷ studied the patterns of eye movements made by college students who were viewing pictures previously judged for goodness of balance. The Weaver adaptation of the Dodge method of eye-movement photography was employed (see above). Analyses of the data revealed large differences in the eye-movement patterns of different individuals looking at the

same picture. No relationship was found to exist "between the judgment of the balance of a picture and the duration, position, or pattern of ocular fixations on either side of the central vertical axis during free observation of the picture" (p. 322). Once again, then, we have a situation in which the beliefs of the artist do not check with the facts of science.

Colors for the Stage. Earlier in this section we commented on the fact that an artist's chromesthetic responses cannot serve as a valid guide to his use of color on the stage. This is not to say, however, that there are no commonly held associations between color reaction on the one hand and temperature, kinesthetic and organic discrimination on the other. Indeed, there are many generally shared associations, a fact shown in a series of studies by Ross.⁴⁸

Carefully calibrated Brigham gelatines were placed in front of a projector whose normal illumination on an area 160 by 130 cm. was 6.5 foot-candles. Each color was shown for 90 seconds during which time the subject filled out rating scales having to do with such issues as emotionality, affectivity, activity, tension, temperature, tragedy, comedy, melodrama and romance, and check lists which contained descriptive adjectives of the sort Hevner (see page 18) has employed with her work on the expressiveness of music. Ross found that "colors which are rated as emotional tend also to be tense, melodramatic, and possibly tragic and romantic. Colors which are rated as active are associated with comedy; hot temperatures are ill-suited for tragedy. Colors which are rated as tense are associated with emotionality, tragedy and melodrama. The warm colors are comic, the cool ones tragic, and colors suited for tragedy are also suited for melodrama" (p. 183). When the colors were arranged in order from hot to cool the following sequence appeared: red, orange and purple, orange-yellow and purple-violet, yellow and violet, blue and yellow-green, blue-blue-green and green, blue-green.

Universality. The great philosopher Immanuel Kant held that sense pleasure could be distinguished from aesthetic pleasure through two characteristics that the latter alone possessed—disinterestedness and universality. With the first of these criteria we need not be concerned here. And the second can apparently be

rejected on the basis of sound experimental evidence.

Gordon,⁴⁹ a student of aesthetic problems (see page 25), chose ten pictures of women's faces, some extremely beautiful and others rather ugly, and showed them to two groups of 100 persons each. The beauty ranks given by the members of each group were separately pooled. The rank orders of the two pools were found to yield a correlational value of .99 even though there were many disagreements among the members of each group. In a second experiment ten rectangles, each containing 100 sq. cms., were judged for preference (see page 25) by two groups of similar size. Although disagreements were again numerous within the groups, the two pool orders gave a coefficient of correlation of .98.

In her third experiment sense pleasure rather than the pleasantness of beauty was studied. Bottles giving the odors of lemon, cinnamon, peppermint, bergamot, lavender, eucalyptus, tansy, creosote, valerian and asafoetida were given to two groups of 100 each for ranking from most pleasant to most foul. This time the degree of agreement within each group was far greater than in either of the other groups whose members were supposedly making aesthetic judgments. Here, then, is proof that ratings based on sense pleasure can be at least as uniform as those based on beauty. In fact in this study the ratings for sense pleasure are more uniform. Kant's criterion, it would seem, was ill chosen.

An Attitudinal Profile Estimated. As the mental test is a phenomenon solely of the twentieth century we must employ other, more indirect, procedures if we desire to assess the attitudes of the aesthetically great of the previous centuries. One of these indirect attacks on attitude can be seen in a study by Ferguson⁵⁰ who combed through the biographies and the works of Jonathan Swift in an attempt to learn how Swift would have answered the questions in *A Study of Values* (see page 26) had it been available in his day. Measures of the completeness of the data were figured by taking the square root of the per cent of the questions for which answers could be found. These values ranged from .77 to .87 for the various sections of the test. Changing Ferguson's raw data into percentiles we find Swift's profile to be approximately as follows: 28 per-

centile in theoretical interest, 50 in economic, 42 in aesthetic, 53 in social, 55 in political and 72 in religious interest.

Craftsman Ancestry. N. Meier,⁵¹ who has spent many years studying the development of drawing ability in the child, has decided that craftsman ability is an essential part of art talent (see page 25). If, then, craftsman ability is so extremely important we may well ask whether relatively more craftsmen can be counted in the talented child's family line than among the ancestors of the less talented.

In an attempt to throw light on this problem Meier has contrasted the ancestries of 176 unselected high-school and college students with the family lines of 644 art students and artists. He found that over three times as many of the unselected as of the artistic group knew of no craftsmen among their ancestors. And, on the positive side, Meier found the average number of known craftsmen to be over twice as great among the ancestors of the artistic as among those of the unselected. Whether we agree with Meier that there is a general constitutional stock inheritance of craftsman capacity or believe that this ability comes into the picture solely or in large part by way of cultural inheritance, we must admit that it tends to run in families and so could conceivably function either biologically or culturally.

Behavior of the Museum Visitor. Starting in 1928 there has been a succession of interesting studies of the behavior of visitors to museums and art galleries. Such research can be very practical, for what is learned about the ways of the visitors can often be used to make the exhibits more effective.

In the most recently published study of the museum visitor Yoshioka⁵² and his associates traced the paths of 3005 visitors through the Medicine and Public Health Building at the New York World's Fair in 1939. It was found that the three types of routes most frequently traversed were the "direct"—from an entrance to an exit other than itself—the "circuit"—from an entrance back to itself as an exit—and the "reversible"—direct route with a divergence. Yoshioka feels that these behaviors can be described in terms of certain principles of animal psychology. He regards the "direct" type as resulting chiefly from direction-orientation, the "circuit" type from exploratory tendency and the "reversible" from an interplay of the two.

He concludes that exhibits can be made more attractive at key positions in the museum so that the tendency to leave at the nearest exit will be lessened. Or, in the phrases of animal psychology, the exploratory tendency can be made more dominant over direction-orientation.

Apparent Distance of Colors. The influence of hue and brightness on estimations of weight, size and distance have been studied in several sets of investigations. The most recent of these studies, one by Taylor and Sumner,⁵³ is on the apparent distance of a set of differently colored tubes which had previously been measured for physical brightness, i.e., for percentage of reflected light. The tubes were fitted over two tiny poles in a lightproof box and were illuminated by a 40-watt lamp. One pole was always covered by a gray tube and was stationary. The other, covered in turn by each of the remaining tubes, could be pulled either forward from the back of the box or backward from the front until it seemed to be as far from the observer as was the gray-covered pole.

Each of the experiment's eleven subjects pulled the movable pole forward 50 times and backward 50 times. When these judgments were averaged it was found that a coefficient of correlation of .99 existed between the relative brightnesses of the colors on the movable pole and their average distances from the stationary pole. Thus, the yellow with a brightness of 76 per cent was a distance of 7.05 mm.; the white with a brightness of 75 per cent, 6.71 mm.; the green with a brightness of 32 per cent, 1.74 mm.; the red with a brightness of 12.5, 1.36 mm.; the blue with a brightness of 7 per cent, .27 mm.; and the black with a brightness of 2.3 per cent, .33 mm. In other words, the brighter the color the closer it seemed to be to the observer.

Suggestion in Art Judgment. The social psychologists have repeatedly shown that verbal suggestions can markedly affect aesthetic judgments in both the musical and graphic-art areas. Sisson⁵⁴ has verified these earlier findings and has added to our body of knowledge the fact that nonverbal cues can also modify aesthetic response.

Ninety plates from the first edition of Meier's Art Judgment Test (see page 19) were separated into three equal sets and were presented to 25 subjects under three different experimental settings. The first thirty were offered

for judgment along with verbal suggestions such as "The left-hand picture is very famous. The right-hand one is a more modern interpretation." The subjects were told to disagree with the experimenter if they saw fit. Only half of the plates the experimenter indicated as "correct" were so designated in Meier's scoring key. Each plate offered as "correct" by the investigator had an obvious but unexplained check mark in the lower margin. The second set of plates also carried the unexplained check marks but no comments. The third set had the usual Meier directions with neither check marks nor comments.

The plates Meier's stencil terms "correct" were preferred by 15.27 subjects who had neither been given the comments nor had seen the check marks, by 16.86 stimulated only by the check marks, and by 19.19 who both had heard the comments and had "seen" the check marks. The plates Meier had classified as "incorrect" were preferred by 6.86 subjects when no suggestions were given, by 7.81 when the cue marks were present, and by 10.64 when both the checks and the verbal suggestions were given. The differences as found were small but consistent and in line with common sense.

Sensory Memories and the Ability to Draw. It has been customary for the teacher of drawing to think of his task as primarily the teaching of graphic expression, a job which is without doubt of extreme importance. But Lark-Horovitz⁵⁵ has clearly shown in a series of observations that even more important is the strengthening and development of visual memory. She feels that the verbal aspects of training have been overemphasized with the result that the adult who has gone through the traditional school-training still keeps his confused imagery and draws in a childlike manner.

In one of the Lark-Horovitz experiments 170 adults were asked to draw ten common objects of the order chair, duck, violin, etc. Race, profession and general background appeared to have no connection with the ability to draw well. The uniformly poor showing of these adults appeared to be due mainly to defects of memory. These the investigator divided into three categories. Many subjects appeared to have *blurred mental images* even when unaware of this state of affairs. A common trouble could be traced to the possession of *clear but fragmentary visual images*. There was also a

considerable lack of real knowledge of the object. Lark-Horovitz concludes that the mental images of her subjects were "sense-mixed," that they were composed of a medley of visual, tactile, auditory and olfactory memories. Her questioning showed that when these adults attempted to reconstruct the object logically they found their mnemonic pictures unfit for graphic expression.

The Arousal of Ideas in "Good" Art. The belief that "good" art is, on the whole, more conducive to imaginative response than is "bad" art seems to be substantiated in a recent study by Patrick.⁵⁸ Six professionally-drawn landscapes and six by amateurs were presented to 20 subjects who were told to talk aloud as soon as the drawings were given them and to say anything that came to mind, no matter how irrelevant. In half of the observations the time for speech was unlimited and for half it was limited to 10 minutes per picture. All changes in thought were recorded—some 240 in all.

Under each condition there were substantially more thought changes while viewing the professionally-drawn pictures, and, during the unlimited observations, the subjects spent relatively more time on them. Self-projection also appeared more often while the "good" pictures were being viewed. Patrick concludes that "good art stimulates greater mental activity and imagination than poor art does."

PAUL R. FARNSWORTH,
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NOTES

¹ In this book the words "aesthetic" and "artistic" are used interchangeably. While certain aestheticians differentiate between the terms it seems unnecessary for the psychologist to do so.

² The importance of empathy in aesthetics is defended in the interesting book by H. S. Langfeld, *The Aesthetic Attitude*, 1920.

³ Pratt, C., *The Meaning of Music*, 1931, p. 203.

⁴ Hevner, K., *Amer. J. Psychol.*, 1936, 48, 246-268; 1937, 49, 621-630; 1938 *Proceed. Music Teach. Nat. Assoc.*, 1939, 199-217.

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¹⁴ Beebe-Center, J. G., & Pratt, C. C., *J. gen. Psychol.*, 1937, 17, 339-353.

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¹⁵ Ogden, R. M., *The Psychology of Art*, 1938.

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¹⁷ The shorter portion is to the longer as the longer is to the sum of both shorter and longer (21:34 as 34:55).

¹⁸ Farnsworth, P. R., *Genet. Psychol. Monogr.*, 1941, 24, 347-381.

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ALCOHOLISM.—Alcoholism is difficult to define since it involves an intricate and qualitative measurement. Not only does the tolerance of individuals for alcohol vary, but an individual's reaction in itself is variable and unpredictable. The only possible evaluation is based on the behavior of the person. A social drinker is able to control his desire for alcohol so that its use is restricted to socially acceptable situations, although at "appropriate" occasions intoxication may result. The alcoholic is handled by alcohol, his drinking is not a part of a social situation but a substitution for it, and alcohol has become for him a *habit forming drug*.

The alcoholic today is a serious social and medical problem. Although the influence of alcoholism on crime and the family has doubtless been exaggerated, alcoholics form a large percentage of our mental hospital admissions, and a recent survey reveals 600,000 chronic alcoholics and 2,000,000 heavy drinkers and potential alcoholics.

Pharmacological research at the Yale Laboratory of Applied Physiology has definitely demonstrated that alcohol is a depressant and not a stimulant. The feeling of well being that an alcoholic experiences on first drinking comes from a narcotization of the higher centers of the nervous system that results in temporarily decreased worry, irritability, and anxiety much as novocaine quiets an aching tooth. With worry stilled and anxiety eliminated, the drinker feels exhilarated and "stimulated," although the effect on the brain and nervous system is just the opposite. This holds true for both the social drinker and the alcoholic. It is this feature which makes the mixing of alcohol and driving so dangerous.

Alcoholism—in a special sense—can be considered a symptom and not a disease. In groups

it is a symptom of widespread social pathology and in individuals it is a symptom of mental and emotional pathology. As soon as its symptomatic nature is generally recognized, its cure will become possible, for most of our present methods are simply an alleviation of the symptom rather than a direct attack on the underlying pathology; as a result such methods are notoriously ineffective. It is as foolish to prohibit alcohol because some people drink to excess as to abolish money because some steal or hoard it. A direct assault is indicated on the conditions that drive man to drink.

If, as we have learned, alcohol narcotizes physical and psychical pain and relieves—albeit temporarily—feelings of anxiety, inferiority, etc., it becomes obvious that it is necessary to eliminate the causes of these feelings. These can be most conveniently divided into two groups: (1) The effect of the prevailing culture and economy, and (2) The individual's inner adjustment to reality.

Our culture today is a traumatizing one. Insecurity and inequality are rampant and the opportunities for success are contracting at a time when ambition is over-stimulated by an inept school system and asocial advertising. Economic and social democracy has lagged behind political democracy, resulting in slums, unemployment, labor strife, and family disorganization. War has added its bit to the mounting toll of frustration, bitterness, and failure. In a culture where success is measured by a money standard, the vast majority are doomed to failure or mediocrity, no matter what their talents or accomplishments. A mounting panacea for these economic and social anomalies has been, for some, a steadily increasing resort to alcohol to lose for a few hours the sense of personal failure, frustration of desire, or feelings of inferiority and thwarting.

It must be noted, however, that most individuals do not become alcoholics due to the fact that their personalities are sufficiently well balanced and maturity has been achieved. In immature, unstable personalities these conflicting economic and social forces which the person is at odds with but has no real means of changing, produce individuals peculiarly susceptible to alcoholism. Contrary to most lay opinion, it is not lack of will or moral turpitude, but powerful, psychic drives and urges that are responsible.

Apart from the contributory social factors, there are strong psychiatric ones. These can be best grouped under the designation of psychic pain. The ramifications of this are widespread and include unsatisfactory sex life, feelings of inferiority, marital and business troubles, organ inferiority, homosexual drives, masochistic or sadistic tendencies, and as a release from the tensions of everyday life which the inadequately balanced personality cannot face. There are, of course, psychotics, neurotics, and psychopaths who are alcoholics. In such cases, the symptom is a manifestation of basic psychiatric malfunctioning and treatment and cure are coincidental to the therapy of the basic personality or physical malfunctioning. There are also a few who drink to narcotize incurable physical pain.

For overwhelming practical reasons, the therapy of the alcoholic must begin first with the individual. A good beginning will have been made when the medical profession, the alcoholic, and the general public are made aware that the alcoholic is a sick person. This is not to imply that all alcoholics are curable: there are many who have so few wholesome qualities left to build on that therapy is hopeless. Some alcoholics, however, are curable and many alcoholics in their primary stages are amenable to therapy. One of our greatest tasks in mental hygiene, then, is the early discovery and diagnosis of alcoholism, and its prompt treatment.

The prophylaxis for alcoholism underlines a drastic discrepancy in our specialized hospitals. Alcoholics are neither insane, nor primarily physically ill. Therefore, special hospitals are necessary for them. Their large numbers and the need for specialized treatment and follow-up not only make separate institutions desirable, but economically feasible as well. The saving in human values would be equalled or exceeded by a corresponding decrease in the cost of public and private charity, exacted by the alcoholic from a reluctant community.

The goal of treatment is permanent abstinence. Once an individual has become an alcoholic, he can never again become a social drinker, because for him alcohol has become a drug with strong habituating potentiality, and one drink is enough to arouse dormant desires. The alcoholic has no choice between abstinence and uncontrolled drinking. For the good of all

concerned, it is best that the therapist, too, be a total abstainer. "Do as I say and not as I do" is an awkward position for the clinician. Every patient presents an individual problem and the treatment approach will be based on this and the interpersonal relationship of patient and physician, so that in the initial stages the psychiatrist is a crutch to take the place of alcohol for the personality.

The initial series of interviews with the patient should determine the method of treatment (if he is acutely intoxicated, this follows detoxification). It must be decided whether the patient can best be treated in a: (1) mental hospital; (2) specialized alcoholic institution; or (3) as an outpatient by office visits. The psychiatrist can be materially assisted in this decision by a careful appraisal that includes such psychological tests as the Rorschach, the Thematic Apperception, the Wechsler Bellevue, etc., in addition to the usual procedures of life history and neurological and mental status surveys. Regular visits or interviews are employed in which distributive analysis and synthesis allows the patient to ventilate and learn how to objectify his underlying strains and tensions. This can best be carried out by following a daily routine (self-imposed if possible, but imposed nevertheless), and the development of new insights, values, interests and amusements. These are aided especially by the socializing effect of a farm or hospital group. The nature of the patient's drinking problem is explained and discussed with him, utilizing all possible avenues of approach including dreams, specific examples from his own life history, childhood memories, present conflicts and past failures and successes. Psychological mechanisms and modes of adjustment are explained, and the fundamental facts of interpersonal relations and mental hygiene indoctrinated.

The time necessary for the initial reorientation of the personality depends primarily on the degree to which the patient's personality has been damaged. It will range from two weeks to thirty months, with a probable average of six months. Another vital factor is the organic deterioration of the patient, which, if well advanced, will often be an insuperable bar to therapy. The cooperation of friends and relatives can be invaluable in reinforcing the suggestions of the therapist and in providing a somewhat sheltered environment in which the

fledgling can try his wings without too great temptation.

When the patient has reached a level of emotional maturity which will enable him to live a relatively efficient, productive, and contented life, with kindly, tolerant personal relations and enough inner poise and stability to replace the former perpetual state of conflict and instability, he will be considered ready for a return to society. As in any serious physical disease such as tuberculosis, the cure depends on the patient's general mental and emotional health. He will, for example, be encouraged to carry candy to satisfy the bodily "hunger" for alcohol when he gets tired and jittery. A complete guide for the reeducation of the drinker has been published elsewhere.¹ It will be necessary, finally, to submit to a lifelong follow-up so that any incipient indications of relapse can promptly be nipped in the bud.

Sooner or later, if the patient is to be considered cured, it is necessary to return the ex-alcoholic to a life situation. It is here that we have made the least progress, for in many cases the patient will not be able to withstand the temptations, stresses and strains of modern, high-pressure, competitive living. To continue an analogy, it is comparable to sending a recovered T.B. patient back to his slum environment. The solution here lies in great measure in the hands of politicians, economists, and sociologists. Security must become a keynote of our future society if we are to destroy our present alcoholic 'climate'. This would include:

1. Economic security by means of increased minimum wages, a ceiling on hours, and a job for all who want to work.
2. Increased provision for wholesome recreation that can be participated in by the family as a unit.
3. A housing program that will provide a wholesome and stimulating environment for a family unit.
4. Legislated restricted hours of sale of alcoholic beverages and restriction of sale to minors.
5. A legislative control of such advertising as appeals to increased drinking.
6. An active program of education by social agencies to broadcast the danger of alcohol and the reconstitution of these agencies to

act as diagnostic and preliminary treatment centers.

7. Increased educational opportunity for the economically underprivileged.
8. An active research program in the causes and cure of alcoholism.

With all our efforts, we shall be unsuccessful if we do not destroy the legend of the "romance of alcohol."² This legend, so diligently propagated by our liquor advertisements, and so innocently indoctrinated by our novels and photoplays, portrays alcohol as an inevitable concomitant of "gracious" living and an absolute necessity if one is to be considered a sophisticated or up-to-date member of society. Drinking and having a good time, drinking and smart living, drinking and style, drinking as a sign of conspicuous spending, drinking as a sign of good fellowship, are all being drummed into the American mind by radio, press, magazine, and billboard. Addressed to emotionally mature adults, such advertising would be comparatively harmless; addressed to immature youth, boys and girls still in their teens, it produces a yearning for the romance of alcohol. Youth hears the repeated shibboleths concerning alcohol: liquor increases sexual potency, liquor is just the thing to pep you up, liquor is absolutely necessary to have a good time. The inevitable result is wholesale drinking among boys and girls too immature to withstand its allure, and to the early development of a tragic addiction to alcohol. This is the problem which the social agencies of the nation must face as their primary objective in the control of alcoholism.

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AMERICAN PSYCHOLOGICAL ASSOCIATION, INC., THE.

—The American Psychological Association is the natural scientific organization of professional psychologists in the United States. It was founded on July 8, 1892, and is therefore the oldest professional society of psychologists in the world. On that date, G. Stanley Hall of Clark University, George S. Fullerton of the University of Pennsylvania, William James of Harvard University, Joseph Jastrow of the University of Wisconsin, George T. Ladd of Yale University, James McKeen Cattell of Columbia University, and James Mark Baldwin of the University of Toronto met at the home of the first named and decided to organize the Association. This group constituted themselves a committee to determine the place, time, and program for the next meeting and to report a plan of organization at that time. This preliminary meeting also elected an additional 22 psychologists to membership. By the end of 1892 there were only 19 psychological laboratories in America. Of these, four were opened that same year, two the year before and four the year before that. Hence this initial membership comprised practically the entire group of professional psychologists in America.

From the beginning the object, as stated in the first and all subsequent constitutions and by-laws, was "to advance psychology as a science." In the early years of the organization this purpose was accomplished by the holding

of an annual meeting, during the Christmas holidays in earlier years and more recently early in September. At these meetings scientific papers were read by the members and by invited guests. As the Association membership increased and when it assumed responsibility for the publication of a number of scientific journals, the necessity for incorporation became apparent and this was accomplished under the laws of the District of Columbia in 1925.

The membership grew steadily from the beginning, reaching approximately 170 by 1905; over 300 by 1915; and 858 full members in 1944. The standards for election to full membership have been very high during the last decades and require, as a minimum, a Doctor of Philosophy degree in Psychology plus "acceptable published research of a psychological character beyond the doctoral dissertations." This last phrase has been variously interpreted by the Council of Directors but has usually been interpreted as two major studies beyond the dissertation. Indeed the qualifications for full membership in the American Psychological Association have been so high that such election automatically qualifies the individual for Fellowship in the American Association for the Advancement of Science.

Because these qualifications for election were so high and could not be met by such a large number of younger psychologists, many of whom were going into clinical or industrial work with little chance of publication, in 1942 these research qualifications were amended to include "five years as Associate subsequent to the granting of the doctoral degree plus evidence of acceptable contribution to psychology." Hence recognition was given at that time to work in the applied fields rather than solely on scientific publication.

Earlier, in 1925, a class of Associates was voted with the following minimum requirements: "at least one full year of graduate work in psychology in a recognized graduate school and who, at the time of application are devoting full time or graduate work that is primarily psychological, or be persons with the degree of Doctor of Philosophy, based in part upon a psychological dissertation and conferred by a graduate school of recognized standing, or be scientists, educators or other distinguished persons whom the Council of Directors may recommend from sufficient reason." The follow-

ing year nearly 100 individuals were elected to Associateship and the number has increased very rapidly and steadily to a total of over 3,800 in 1944. Associates have all the rights and privileges of Members except the right to vote at the annual business meeting.

In 1922 the Association purchased, from the Psychological Review Company, five journals: The Psychological Review, Psychological Bulletin, Journal of Experimental Psychology, Psychological Monographs, and the Psychological Index. This latter was subsequently discontinued in 1900. In 1927 the Psychological Abstracts were started under a subsidy from the Laura Spelman Rockefeller Foundation. In 1926 the Journal of Abnormal and Social Psychology was acquired by gift from Morton Prince. In 1942 the Journal of Applied Psychology was acquired by purchase. Hence the Association now publishes seven scientific psychological journals. These are edited by an elected Editorial Board with one editor for each journal and the policies are determined by a committee composed of editors, members of the Council of Directors and the Business Manager, who always has been the Treasurer of the Association. The Psychological Abstracts have been distributed free to all Members and Associates from its beginning and, more recently, the Psychological Bulletin as well. For many years, the Association has published annually a Year Book containing the names and professional data of all Members and Associates.

The core and real purpose of the Association has been the annual scientific meetings. One of the features of these meetings has been the Presidential Address. The list of Presidents of the Association is far too long to give in this place, but it includes the names of most of the distinguished American psychologists. Actually several scientific papers were read at the preliminary meeting at Clark University and a regular program of 12 such papers was organized for the first regular meeting of the Association at the University of Pennsylvania on December 27, 1892. In 1940 a total of 180 papers appeared on the program. Such meetings have been held annually until 1942-1944, when the scientific programs were eliminated because of war conditions, although business meetings were held in those years. A program for the 50th Anniversary Meeting at Harvard was planned but was finally cancelled for this

reason. The meeting in 1929 was also eliminated and became part of the International Congress of Psychology held at Yale University in the summer of that year. A total of 34 meetings were held at Eastern institutions, 16 in the Middle West and one on the Pacific Coast and one in Canada.

An analysis of the subject matter of the papers presented on the programs shows a trend from theoretical and more strictly systematic experimental papers to those primarily concerned with clinical, educational and industrial applications of psychology. Joint meetings were held with the American Society of Naturalists, American Association for the Advancement of Science, the American Philosophical Association and the Southern Society for Philosophy and Psychology. In recent years, the American Association for Applied Psychology, the Psychometric Society, and the Society for the Psychological Study of Social Issues arranged their meetings at the same time and place as the American Psychological Association. A number of symposia on a variety of subjects were arranged from time to time; round-table discussions were introduced in 1913 and for several years there were special sessions for the presentation of papers by graduate students. Attendance at the annual meetings has always been good compared to the size of the membership. In 1940 the record attendance of more than 1,200 persons was registered.

With the growing interest in work in the applied field, a Section of Clinical Psychology was adopted in 1919. Three years later the Association authorized the certification of clinical psychologists but so few psychologists asked for such certification that the scheme was discontinued in 1927.

The Association is directly represented on the Council of the American Association for the Advancement of Science, the American Standards Association, Inter-Society Color Council, National Research Council, and the Social Science Research Council. Most of the special or regional psychological societies are affiliated with the Association.

The finances of the Association have had a varied career. From the start until 1919 the dues were a very nominal \$1.00 a year. They were raised in that year to \$2.00 and in 1923 to \$5.00 a year. However \$3.00 of this latter sum was earmarked for the Psychological Abstracts

which were sent free to all members. In 1925 the dues for Members were placed at \$10.00 and for Associates at \$6.00. This increase was necessary to build up a reasonable working capital because the Association had assumed publication of a number of scientific journals. Before this year there had never been a surplus of as much as \$1000 in the Treasury at any time. Gradually a surplus reasonable for safe protection of its publications has been built up.

As the Association became larger and as its affairs became more and more complicated, the management of its affairs came more and more into the hands of its Officers and the Council of Directors. Democracy, however, has never been sacrificed. Officers and Directors are both nominated and elected by a secret mail ballot of the Association and, in recent years, the election has been by the preferential balloting system. Furthermore, the Directors merely recommend action to the annual business meeting which then votes in democratic fashion. The one exception to this has to do with the scientific journals where action regarding policy must necessarily be direct and made by a small informed group.

One important function of the Association has been performed through the work of its special committees. These have been appointed to cope with a variety of topics such as methods of teaching psychology, the relations of psychology and medical education, on precautions in animal experimentation, audio-visual aids, psychology and the public service, preparation of examination questions in psychology, and many others. A program committee has been charged with the organization of the papers to be presented at the meetings. A Committee on Scientific and Professional Ethics has quietly but effectively corrected any such ethical infractions by any of the members of the Association. Reports of these committees appear in the official Proceedings of the Association and, from time to time, special reports have been published and circulated among the members.

It becomes evident, from this account, that the interests of the membership followed current trends in psychology from an interest which was largely theoretical, systematic and "academic" to one which was largely practical, specialized, and applied to the betterment of human welfare. Such a trend is to be seen in the organization, in 1937, of the American

Association for Applied Psychology, which in 1944 had a membership of more than 725 qualified members. Within the Association the same trend is seen in the subject matter of the scientific papers which have appeared on the programs. It is also clearly seen in the change of qualification for full membership. Hence in 1942 a Joint Constitutional Committee was founded which was charged with the drawing up of a new set of by-laws for the Association which would again bring together all professional psychologists into a single organization. This joint committee was composed of representatives of the American Psychological Association and the American Association for Applied Psychology. They met in May 1943 and drew up a set of By-Laws which was presented to the meetings of these two organizations in September 1944 and unanimously adopted. A transition period of one year intervened before this new scheme went into effect.

It was decided to retain the name of the American Psychological Association because of the age and prestige which it carries. The object of the new organization is "to advance psychology as a science, as a profession, and as a means of promoting human welfare". It shall consist of three classes of membership: Fellows (present Members in the APA or Fellows in the AAP or others with similar qualifications) Associates and Life Members. It is to have the form of representative democracy, in that a Council of Representatives becomes the legal body of the Association with full power and authority over the affairs and funds of the Association. This council shall be composed of Divisional, Regional, and Special Representatives, together with the Officers of the Association. A total of some 20 Divisions are contemplated, each dealing with some special field of psychological interest. Divisional representatives will be elected by the Divisions on the basis of the number of members. One Regional Representative shall be elected by the members resident in some nine geographical districts. Three Special Representatives may be proposed by the Council for special reasons. There is also provided a Board of Directors composed of four officers and six others elected by the Council of Representatives from among its own membership. A secret mail ballot is provided for all elections. Also a Policy and

Planning Board is provided and is to be elected by the Council of Representatives. Affiliations by other Societies are invited as heretofore.

One very important change is the organization of a Central Office of the Association "for the promotion of the objectives of the Association and its Divisions". "The functions of the Central Office shall include the administrative detail of the Association, the business management of its publications, issuance of the yearbook, facilitation of personnel placement, promotion of public relations, and such other general and special services as are allocated to it by the Council of Representatives and the Board of Directors". An Executive Secretary is to be employed as the administrative agent of the Association and as managing director of the central office.

By the adoption of these new By-Laws, the American Psychological Association has changed its character from a society which was essentially scientific in character to one which is essentially professional. This is entirely in accordance with the trend of interests and activities of psychologists in America. The formation of the Central Administrative Office is essential, not only because of the new functions such as personnel placement and public relations, but because the Association had already grown so large and its affairs so complicated that its administration could no longer be expected of individuals who gave of their time and energy and thought on a volunteer basis.

Sources of material concerning the American Psychological Association may be found in the Year Books published annually since 1918. Before this lists of Members were published. The Proceedings of the scientific and business meetings of the Association appeared in the Psychological Review from 1894 to 1903 and subsequently in the Psychological Bulletin.

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ANIMAL NEUROSES.—I. WHY ANIMAL STUDIES ARE IMPORTANT. The term neuroses

was first introduced into the literature on animal behavior by Pavlov. Since he qualified the term by speaking of "experimental neurosis" it is reasonable to grant some liberty in the use of the term. When applied to animals below man, neuroses must be defined in terms of behavior rather than in psychic terms. In defining neuroses as a disease of the mind one automatically excludes the animal evidence and restricts the study of abnormal behavior to human cases. Neurosis defined in terms of personality change likewise handicaps the student of animal behavior. An animal may show an altered behavior in the test situation, but not out of the situation. Does failure to persist in an altered way mean that personality has not been changed? It is possible that the human being who shows a consistently altered behavior does so because he carries his worries with him. If he did not have a highly developed imagination "out of sight would be out of mind" and he then would show his altered behavior only under limited conditions. To restrict neurosis by the excellence of one's imagination seems to limit the concept of neurosis by factors which are independent of neurosis as such. At least this would be the belief of the student of animal neurosis.

If we are able to define our concepts of the abnormal in terms of behavior characteristics, diagnosis is made more objective and we gain access to a whole new field of research. In studies of human cases, research is limited to an "after the fact" analysis. The physician can go into the case history of a person and find circumstances which might appear provocative. He may go beyond this historical method by studying many cases and looking for common factors. However, both of these methods are open to critical errors. The life of any person contains many disturbing experiences and it is difficult to determine which or how many of them participated in causing the disturbance. Nor can one determine whether a given experience was disturbing because (1) the individual was susceptible to mental illness, (2) had his peculiar way of looking at life, or (3) the experience was the last straw in a chain of events. It is possible that similar stressful conditions are common to a group of neurotics, but if the same conditions also are present in the lives of well adjusted individuals, it is difficult to evaluate the apparent inconsistency in the effects

produced. Why do some and not others succumb to a neurosis producing situation if the situation is a cause of neurosis? It is also difficult to know how to group or classify provocative conditions. Perhaps a wide range of conditions are similar in effect; perhaps a specific condition is common to all, but it is difficult to isolate because so many variables are present; and perhaps a certain combination of conditions is needed. Unless factors can be independently varied scientific analysis is handicapped.

Another approach is to study the conditions under which a patient is cured. The psychiatrist may aid a person by locating an early childhood conflict. He may also give the patient sympathy and understanding as well as influence the people closely associated with him. What really cured the patient becomes a question. If the psychiatrist's theory of neurosis seemed to work, does it prove his theory is correct? To say it does is similar to saying that a headache was caused by a lack of aspirin because giving aspirin resulted in relief.

When animals are available for investigation, one may set up experimental conditions and expose animals with similar backgrounds to the same conditions. One can vary the previous backgrounds and hereditary factors and one can observe the symptoms as they appear. Likewise, one can be more objective in attempting cures. The doctor must do all he can for the patient but the animal psychologist can vary his remedial conditions and apply them differently to several groups. These are the necessary privileges which the research worker must have and only animals below man can be experimented with under these conditions.

It may be argued that data obtained from animals do not apply to human beings. Granted, some distinctions must be made. Some things are more important to human beings than to dogs, human beings live in a different kind of society than do dogs, they are influenced more by language than are dogs, and they are more intelligent than dogs. However, dogs, like men, can learn. They too can develop fears, their normal behavior can be restricted, they have emotions. If neurosis is due to conflicts or stressful frustrations, these conditions can be set up in the lives of animals. If animals below man show peculiarities similar to neurotic humans, should we suppose the symptoms have a different meaning because they appear in non-

humans? The student of animal behavior looks for reasonable similarities and considers differences in species before making his claims, and at the same time appreciates that basically all living forms are alike in many ways. The same basic laws of learning, of development, of heredity, of instinct and of memory apply to all forms and only minor adaptations must be made to have them fit a given species. If we grant that basic similarities in behavior dynamics exist in all forms, we extend the opportunity for research by adding a new source of data. Clinical and experimental data can then be used to substantiate and test theories.

II. OBJECTIVE OR BEHAVIORAL DEFINITION OF EXPERIMENTAL NEUROSIS

In the earliest case in which neurosis was claimed in the animal (Pavlov, 1927), a dog was trained to salivate whenever a luminous circle was exposed, but not to salivate when an ellipse was exposed. The circle had become a food signal, the ellipse a signal for no food. This type of problem is readily learned by dogs as well as by other animals. We speak of it as discrimination learning by the conditioned response method.

The discrimination was now pressed further by gradually making the ellipse more like a circle. When the semi-axis of the ellipse had a ratio of 9:8, the animal was unable to make the discrimination between the circle and ellipse with a high degree of accuracy. After three weeks the discrimination became worse rather than better and finally was lost altogether. At the same time the behavior underwent a change. The previously quiet animal that had submitted to the harness and other equipment needed for recording behavior now squealed, struggled and bit at the equipment. When released from the room it barked violently. Later, when tested on the more simple discriminations it was found that the benefit of the previous training was lost.

Pavlov claimed the dog showed an acute neurosis and found that some of the other dogs similarly underwent a behavioral change when submitted to the same kind of problem.

The behavior shown by the dog was contrary to expectation if we supposed that we were dealing with learning. Practice should not cause a loss in learning, and the dog should not struggle in a situation to which it had

learned to submit. In short, the animal ceased behaving according to ordinary rules and when it ceased being normal Pavlov called it abnormal. If we contend that neurosis represents a break with normal behavior there is an implication that the two conditions are basically different, and not different degrees of the same personality. This raises an important theoretical problem because ordinarily normal and abnormal behavior are considered different only in degree.

The condition which led to the break was (1) an insoluble problem; (2) bodily confinement with no avenues of escape; (3) the necessity of choosing between two stimuli which could not be ignored, and (4) continued and repeated exposure to this situation.

III. FURTHER EXPERIMENTS WITH THE CONDITIONING METHOD

Since the original work of Pavlov, a variety of further symptoms have been observed. Gantt studied a neurotic dog over a period of many years and observed the onset of abnormal sexual behavior. For no apparent reason erections with ejaculations occurred when the dog was in the presence of persons who had previously worked with him, or when given food of the type that had been used in the experiment. The behavior in question seemed to appear spontaneously and was unrelated to the problem which caused the original disturbance.

Liddell and his associates demonstrated changes in heart rate with the onset of neurosis in sheep and in pigs, and these changes were relatively permanent. In other cases he found that animals that were trained to lift a forepaw when the signal for shock to paw was given, instead of continuing to react to the signal by foreleg flexion, developed a stiffened limb which could be raised only with great difficulty. Here again it may be noted that the symptoms were not according to expectation and they show similarities to those frequently found in disturbed human cases.

Liddell believes that the essential conditions for producing abnormality are (1) self-imposed restraint which the animal gradually develops by submitting to the confining harness, and (2) the strain of waiting for the signal for punishment which inevitably and repeatedly occurs. The fact that doubling the length of the daily experimental period was followed by a neu-

rosis lends support to the second condition. The importance of self-imposed restraint is suggested by the fact that forcibly confining the pig was ineffective for developing a neurosis producing situation, whereas gradually training the animal to submit was effective.

IV. OTHER TYPES OF SITUATIONS AND ABNORMALITIES

Violent seizures can be produced in rats under certain conditions. The basic pattern consists of undirected and violent running in circles for a few seconds. This phase may be followed by a convulsion in which either the limbs stiffen or engage in clonic activity. The third stage is one of passivity in which the heart rate shows a profound drop and the animal is relatively insensitive to moulding and all forms of stimulation. The animal may remain in this condition of stupor for one to fifteen minutes. All three stages may be present or either of the last two may be absent. In case the last stage is absent a succession of short convulsions may occur.

Some strains of rats are more susceptible than others and rats with susceptible parents are more likely to show heightened susceptibility than offspring of normal parents. Drugs such as metazol increase susceptibility and drugs such as dilantin reduce it. Likewise extreme fatigue and lowered body temperature reduce susceptibility.

Whether or not this pattern should be called neurotic behavior or a catastrophic reaction (Goldstein's term for completely disorganized behavior when stimulation exceeds the animal's ability to handle it) remains a matter of definition. Maier used the term neurotic because he believed it resulted from an unresolved conflict. He obtained the pattern most readily when the animal was driven by a disagreeable air blast to make a response to a situation it could not solve or from which it could not escape. Since mere exposure to sounds such as jingling of keys, loud hiss of air, electric bells and intense pure tones (including supersonic) also produce the pattern, this behavior has been called an *audiogenic seizure* (Morgan), the implication being that it is purely a reflex reaction to certain sounds. Exposure to an irritating sound may serve, however, as a conflict because the animal is unable to escape and in such case the sound is merely an aspect of

the conflict for a confined animal. Exposure to smoke (in mice) and electric shock used in place of an air blast to drive the rat into making a choice which will lead to punishment, likewise have produced seizures.

Whatever may be the final analysis of the conditions underlying the seizures, it is evident that the seizure represents a clear cut type of extreme abnormal behavior which is analogous to many of the convulsive disorders in man.

Another form of abnormal behavior occurs when animals are forced to continue to react to an insoluble problem. When rats are permitted to choose one of two cards in discrimination apparatus, they readily learn to choose a particular card providing one leads to food and the other leads to punishment. If, however, punishment for choosing is given at random and not in accordance with the choice made, the animal is unable to learn to escape punishment. When obtaining food depends on making choices and the chances of obtaining food or punishment are equal, the animal soon refuses to make a choice and consequently starves to death. This fact demonstrates that an insoluble problem is very unpleasant to the animal. If we now induce the animal to make a choice either (1) by blowing a blast of air on it or (2) by giving it electric shock for resisting, the animal is forced to choose. This condition may produce the seizure pattern described above or it may give rise to a behavior fixation. The fixated response is a stereotyped and stubborn reaction to the situation. Most commonly the animal fixates the reaction of choosing on the basis of position (the card on the right or left). In general, the fixated response is one which is most convenient for the animal in the particular situation.

A fixated response is different from a habit in that punishment does not alter it and it is much more rigid and invariable. It has the characteristics of a compulsion in that the animal continues to show the response even when it knows that it will be punished and that a different choice will not be punished. For example, suppose the animal has a fixation of choosing the card on its right. If we punish it for choosing a black card with a white circle and reward it for choosing a white card with a black circle, it receives punishment whenever the white circle is on the right, or fixated, side.

Soon the animal hesitates to choose this card. However, it does choose the card to the right and takes the punishment. The animal thus recognizes the punishment card but continues to choose it. The animal also practices its fixated right going response and takes punishment when the alternative is a dish of food on the left. Other evidence also points to the interpretation that the fixated response continues not because the animal does not know an alternative, but because it cannot give up the fixated response.

Here again we have a kind of response which is senseless when looked at from the outside. We do not expect the fixated response to be learned under conditions which do not favor such learning and we classify the behavior as abnormal. The fact that the above experimental condition causes some animals to develop fixations and other animals to continue to behave normally indicates that at a certain point a change in function occurs in the animal. When this breaking point is reached, the behavior must be described by other laws than formerly and it is for this reason that abnormal behavior seems senseless. However, we must recognize that it is senseless merely from the point of view of normal behavior.

The work of Masserman with cats likewise shows behavior which seems inappropriate from a certain point of view and it is at this point that he speaks of his cats as being neurotic. He trained cats to go to a box, raise the lid and feed at a sound or light signal. When the response was learned, a conflict was established by blowing a blast of air in the cat's face at the moment of feeding. Masserman speaks of a conflict between fear and hunger, the air blast serving as a fear stimulus. This technique resulted in the appearance of a variety of behavior patterns which Masserman calls neurotic. He classifies them into three categories: (1) Chronic anxiety shown in or out of the situation as indicated by restlessness, trembling, crouching and alterations in pulse and respiration. (2) Phobic responses and attempts at escape when the food signal is given. The tendency to feed is greatly inhibited and many cats starve themselves. If the animal is pushed toward the feeding box the fear is exaggerated. (3) Other symptoms such as excessive cleaning and efforts to secure fondling by the experimenter also

appear. Some develop fixations in the form of stereotyped methods of escape. Senseless behavior of a compulsive nature also occurs. For example, on the presentation of the food signal a cat might hide its head in the box without taking food, although very hungry.

These behavior manifestations correspond with many already described, but the classification as neurotic is largely suggested because the behavior is inappropriate from the point of view of learning and motivation. The uniqueness of neurotic behavior becomes apparent when we consider the following conditions which are ineffective for producing it. Placing a barrier in front of the food box prevents the animal from feeding when the signal is given, but the effect of this method is to cause the animal to cease reacting to the signal. Likewise, the animal may become accustomed to the frightening effect of an air blast and react less and less. When however a conflict is present, a group of behavior patterns occurs which do not seem to be called for by the training method.

Interesting also is the fact that cats made neurotic prefer milk containing alcohol to plain milk, whereas normal cats prefer the ordinary milk. Intoxicated neurotic cats lose some of their phobias. This fact is particularly interesting since the cats resemble human alcoholics.

Other experiments have been performed in which conditions of nervousness and frustrated behavior have been shown. The above examples illustrate the more extreme types of disturbance and the situations for producing them are the most representative for studying neurosis.

V. THEORETICAL CONSIDERATIONS

If we think of abnormal behavior as extreme degrees of normal behavior, then normal and abnormal behavior become different degrees of functions of the same behavior mechanisms. This is the usual and generally accepted view. Despite this fact behavior is characterized as neurotic when it is different from expectation, not merely more or less than of what is expected. Punishment for a response instead of lessening a response, freezes or fixates that response. A feeding signal, instead of being ignored when feeding is made unpleasant, builds up phobias and anxieties which extend outside the situation. In order to account for

results entirely different or opposite from those expected, one must postulate the introduction of added determiners of behavior, not the continuation of determiners already in operation.

In all of the situations in which marked changes in behavior occur, a stressful condition is present. Pavlov, Masserman and Maier believe conflict is present. Liddell emphasizes strain and restraint. In addition, all experiments contain an element of confinement and inability to avoid a problem. Thus, in one type of technique, a discrimination cannot be made, but the problem continues to demand a different reaction (Pavlov's method). In a maze problem which the animal cannot solve, a breakdown does not occur, but in such a case the animal brings itself to the choice situation. In Pavlov's situation, however, the necessity of a choice is imposed and the animal is confined.

In Liddell's situation, the animal must patiently wait for a punishing signal which inevitably occurs. When the series of tests is long, the problem not only becomes more stressful, but more confusing. In Maier's situation, a response which the animal has no inclination to make is forced upon it through the medium of an air blast or an electric shock. Finally, Masserman gives the food signal which through added training is a reminder of the air blast in the face and the animal cannot control its occurrence.

These observations are also supported by experimental results which deal with conditions which relieve the animal's disturbance. (1) Masserman found that cats could be cured of their neurotic behavior if they were trained to manipulate the feeding signal. (2) Discrimination problems in general, even if the animal cannot learn them, produce no neuroses but in these the animal determines when it will make a choice. (3) Maier found that conflict situations in which convulsions occur are less effective if the animal is free to make an abortive or substitute reaction to the conflict situation. Also the appearance of a fixation reduces the nervousness of an animal and makes it respond more readily to a frustrating situation. The fixation does not solve the problem but it gives the animal a stereotyped reaction which it can use in the situation, thus making choice unnecessary. Guiding the animal into a correct

response also relieves the animal of facing a choice which is imposed and this method readily cures fixation, although it is ineffective for teaching the same animal anything new.

It appears that when an organism is persistently driven into making a choice it cannot bring itself to make on the basis of preference, we place it under a strain which it cannot withstand. The responses which finally occur are likely to be violent and catastrophic and fail to show any of the characteristics which are to be expected by the motivational conditions which are part of the conflict. Great variations in individual expressions may be expected since no direction in response is specified. Species difference may occur and in all cases the responses are likely to be those which are readily accessible to the animal. Discrimination and differentiation are lost because these call for mature development and fine control, not mere accessibility. Exaggeration in behavior is a common trait because this indicates lack of discrimination. Convulsive phenomena may occur in extreme cases and convulsive phenomena are primitive reactions in that they engulf the total musculature (loss of individuation).

When we think of abnormal behavior as a break with the normal, we do not look for the same meaning in the abnormal behavior that we do when we think of it as a continuation of normal behavior. Rather, we seek to analyze the nature of the mechanisms which take over when the stimulus-situation is beyond that which the organism can handle. However, if we attempt to explain the abnormal in terms of normal mechanisms we seek for an analysis in terms of a motive. Often the motives are not apparent and so we are inclined to invent hidden or unconscious motives. The animal work appears to encourage the notion that much of disturbed behavior is without a motive. For the frustrated individual the behavior is more an end in itself than a means to an end. Obviously, more research is necessary before clear and precise concepts can be developed in psychopathology. The animal approach is a different approach and it raises some interesting and different notions. Eventually all sources of data must be integrated into comprehensive and unified theories.

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APTITUDES AND APTITUDE TESTING.

Definition. Aptitude is defined in various ways by different authorities. It may mean aptness or quickness in acquiring some skill or ability. It generally implies that there are constitutional, and perhaps inherited, factors to account for this quickness, because some people have practiced diligently for years under the best of tutorship and still do not achieve what others appear to acquire with far less time and effort. The terms special ability and talent are frequently used synonymously with the term aptitude. A talent or special ability for music, art, or mechanics, for instance, indicates the

possession of mental-physical factors above the average, roughly the 80th percentile. Aptitudes may differ from Thurstone's primary abilities in that (1) aptitudes may be made up of clusters of abilities and (2) primary abilities are considered to be mental, while aptitudes may be a combination of physical and mental factors. There is a great deal of overlapping between the two concepts, however. The most common aptitudes are considered to be musical, artistic, mechanical, mathematical, clerical, medical, legalistic, dancing, or some such ability or skill involving specific clusters of abilities which in some central aspect are relatively free of overlap from one another. General mental capacity or intelligence may be considered an aptitude, although it is not so considered in this discussion. Intelligence tests usually find a place in any test battery since if two people are equal in aptitude score, one may still be superior to the other because of superior mental ability. For the same reason personality and physical tests may be included and may, in some instances, be the basis of an aptitude. Selling ability, for instance, is frequently considered to be associated with an extroverted personality.

Theory. The concept that individuals differ from one another underlies all theories of aptitude testing. The difference may be inherited or acquired, congenital or post-natal, physical or mental, or any combination of these factors. Any factor or group of factors which accounts for variations in achievement, when opportunity for training is held constant, is a possible basis for aptitude. One investigator, Spearman, believes that the individual aptitude consists of some unique (1) nerve condition or nervous organization, (2) muscle strength, kinesthetic sensitivity, or accuracy, (3) glandular condition, or (4) combination of these three. In more cases than not, the factors responsible appear to be inherited because (1) they appear early in life without opportunity for practice, (2) the differences observed are greater than can ordinarily be accounted for through environmental influences, (3) some persons never are able to achieve a high level of achievement even with years of diligent effort, (4) equal training generally increases rather than decreases individual differences, (5) the aptitude has a stability or permanence which indicates a constitutional basis, and (6) physical factors are fre-

quently found which actually or presumably account for the aptitude. In most cases aptitudes are not to be identified with types where one either has a high talent, or none at all. The ability exists as a continuum from some zero point through all intermediate degrees to the highest possible degree.

Aptitudes are looked upon in three different but related ways with respect to constitutional organization. (1) Spearman's two-factor theory would divide the ability first into a general factor (*g*), and second into a specific factor (*s*), the main distinguishing element being the specific factor since it is different from all other specific factors (*s*'s), or aptitudes. If the talent is a simple one there may be only one *s* factor, but if it is complex, as in music, there may be several *s*'s organized into clusters, sometimes called group factors. (2) Thompson, Garnett, Hull, Thurstone, and O'Connor believe only in group factors, a multifactor theory in which there is no common factor (*g*). (3) Thorndike first held a rigid *s*-factor theory which he later modified into a three factor viewpoint, the three factors being abstract intelligence, social intelligence, and mechanical intelligence. None of these theories is mutually exclusive nor do their proponents hold to them as rigidly as they did originally. In test practice they would all go about test construction in much the same way.

Thurstone has been attempting to isolate and measure the fundamental human abilities in order to find pure factors which when either taken singly or in clusters will give an inventory of all aptitudes and abilities. So far the factors of memory, number, perceptual speed, speed of judgment, space, induction, verbal comprehension, and word fluency have been found. Likewise O'Connor considers such factors as introversion, extroversion, number ability, creative imagination, structural visualization, inductive reasoning, analytical reasoning, finger dexterity, tweezer dexterity, observation, memory for design, tonal memory, pitch discrimination, and number memory, primary abilities which can be used for vocational guidance.

An aptitude test is generally characterized by the following: (1) it measures some innate ability which is relatively, not entirely, uninfluenced by training, (2) it can be given before training has even started, and (3) it predicts the degree of success one will achieve with

training (other factors being equal), or it differentiates between good and poor groups who have had equal training and motivation. Those tests which do not satisfy these criteria should not be classed as aptitude tests although it is impossible to draw a sharp distinction between them and between achievement and general ability tests.

Measurement of Musical Aptitude. Stumpf started about 1885 to propose tests of musical talent and since that time Revez, Rupp, Seashore, Lowery, Schoen, Kwalwasser, Dykema, Ortmann, and Drake have made significant contributions. This field probably offers one of the best potentialities for aptitude testing because the talent (1) exists in purer form, (2) appears earlier in life, and (3) is manifested in higher degree than in most other aptitudes. The best known tests are Seashore's six Measures of Musical Talent originally (1919) recorded on Columbia records. This set consists of three fundamental measurements of the sound wave as discriminated by the human ear, pitch (frequency), intensity (amplitude), and time (duration), one test of consonance (combination of paired frequencies), one test of rhythm (combinations of durations), and one test of tonal memory. Except for consonance, which consistently was unsatisfactory, the reliabilities ranged from about .68 to .94, either by the retest method or by the split-half, Spearman-Brown correction method. Validity coefficients measured by teacher ratings were generally low but have been as high as .53 for pitch, .50 for tonal memory, .41 for time, .37 for rhythm, .16 for intensity, and -.03 for consonance. It has shown some power also to discriminate musical from non-musical groups as well as advanced high school orchestras from those rated inferior. In 1939 the set was revised and recorded on RCA discs. The main changes were the substitution of a timbre test for the old consonance test, improvements in selection of means for making recordings, refinements in electrical transcription, and a Series A and a Series B are available. Series B is not equivalent to Series A since it is more difficult and intended for higher levels of talent. Because either Series is less than one-third the length of the original 1919 set it possesses lower reliability. If both series are given, however, most of the reliabilities are satisfactory. No study of validity of the new test of timbre has ever been reported.

Actually Seashore has always opposed the study of the validity of any of his tests, maintaining that correlating them with musical ratings or performance is unnecessary. It is argued that pitch, intensity, rhythm, timbre, consonance, and time are acoustical qualities of the musical mind which will be possessed in high degree by the person who is musical, and since accurate measurements of these qualities have been made the tests are automatically validated. It is true that each test measures quite adequately the attribute indicated by the test name, but to what degree each is important for the musician, or how well each predicts or is a measure of musical aptitude, are important topics which have not received the attention they merit. Data from outside the Seashore laboratory indicate that pitch and tonal memory are measuring important functional aspects of musical talent but that the rest of the battery fails to differentiate known musical from known non-musical groups. Until it has been shown that intensity (loudness in the 1939 set) discrimination makes a pianist or other instrumentalist play with greater appreciation and control of dynamic nuances than one who is inferior in this test, or that rhythm discrimination differentiates between those who are inferior and superior in this quality, or that timbre is correlated with tone production, or that time discrimination predicts differences in ability to accurately keep time in a functional way significant for musical accomplishment, we are unable to say how valid these measures are for testing musical talent. Factor analysis indicates that they measure some common factor, or factors, probably aural sensitivity, concentration of attention, and memory, which are valuable for the musician, but they are better measured by the pitch and tonal memory tests which account for most of the validity of the battery and the remainder of the variance is of little musical significance.

The Drake Test of Musical Memory is an aptitude test which presents 12 two-bar melodies as standards to which possible changes in key, time, or notes are to be compared. The standard always remains the same length while the number of comparisons increases with every other trial. It is easy enough for the third grade and extends in range to the advanced adult level. The author gives much evidence that musical memory is the *sine qua non* of musical

talent, the factor without which musical achievement is never more than mechanical or mediocre. It is dominant in intonation, conception of a piece as a whole, perceiving relationships in interpretation, and in such activities as conducting and composing, and in all public performances with or without benefit of musical notation. Objective and biographical investigations confirm the importance of this factor. All prodigies have phenomenal memories, as do all great musicians. Reliabilities vary from .85 to .93 when the two forms are treated as one. Each form alone has a reliability of about .75 for heterogeneous high school groups. For musical subjects this may be raised to as high as .85. Validities vary from .50 to .67 with teachers' rankings and formal examinations. A correlation of .27 is reported between years of training and test scores for a group varying in both age and amount of training. Ease and objectivity of administration are increased by using recorded material.

Other tests have been constructed by Schoen, Lowery, Ortmann, Madison, and Drake but they either are not standardized, valid, or reliable, or they are achievement tests influenced by training to an extent which makes them impractical as aptitude tests. Many other factors hitherto unexplored by tests are important in musical skills and could be brought within objective measurement. Muscular speed, accuracy, and coordination are necessary for pianists, violinists, cellists, and some other instrumentalists, as is a "God-given voice" for singers, but such tests are still to be constructed. Music aptitude tests, and other aptitude measures, are still of more value in predicting who *cannot* succeed than they are in predicting who can succeed. Without certain abilities one cannot achieve more than mediocrity, but the mere possession of high abilities does not guarantee achievement because many other health, motivating, and social factors are also involved.

Measurement of Mechanical Aptitude. Tests in this field are of three general kinds: (1) assembly, (2) perceptual, and (3) muscular accuracy and coordination. The assembly tests are represented by the Stenquist and Minnesota Mechanical Assembly Tests in which such mechanical gadgets as door bells, electric light switches, locks, pistols, and mouse traps have been taken apart and the task of the testee is to re-assemble them as quickly as possible.

Validities and reliabilities of these two tests are fairly satisfactory, both being about .75.

Of the perceptual tests, the Minnesota Spatial Relations Test is probably the best known. It consists of four boards each having 58 different cut-out shapes in which the testee is to place 58 corresponding cut-out blocks. If one cannot recognize or judge size and shape accurately he will make a poor time score. For the four boards the reliability is reported to be .84 and the validity as measured by correlations with quality of shop work as .53. However, engineering students made lower scores than liberal arts students. This rather unfavorable indication may not be as serious as it appears because the ability measured could be important in other aptitudes also, particularly in art. A paper and pencil form of the test known as the Minnesota Paper Form-Board Test (Likert and Quasha) measures the same perceptual abilities without calling upon manual or manipulative abilities. A validity coefficient of .52 with shopwork is reported. Students in engineering and mechanical courses score higher than other groups. The last four subtests of the MacQuarrie Test for Mechanical Ability are perceptual tests. The first three, tracing, tapping, and dotting, are manual or muscular coordination tests. Altogether this test seems to have about as high a validity as any aptitude test of its kind. Validities of as high as .81 with ratings of pupils' mechanical work when the subjects are unknown to the judges have been reported for the whole battery. For completeness of sampling the various abilities necessary for shop work in high school this test is superior to any other single test. Another perceptual test, which also involves a certain amount of muscular coordination, is the Wiggly Block Test by O'Connor. Although O'Connor does not consider it exclusively a mechanical aptitude test he does think it measures important abilities necessary to the engineer, scientist, draftsman, architect, surgeon, and sculptor. At the Human Engineering Laboratory at Stevens Institute of Technology, and other places, O'Connor uses this and a black-cube test as measures of primary aptitudes in engineering and other vocations in spite of the low reliabilities and validities generally reported. The only justification for this would be that it measures only one of several abilities necessary for the aptitude in question. Further objective data are highly to be desired

concerning the value of these tests in view of the number of people who are being given vocational advice and who sometimes change their whole pattern of life as a result. Cox has developed a series of eight mechanical ability tests ranging from very original and difficult perceptual tasks to rather simple manipulative tasks. It is by far the most ambitious, ingenious, and promising of all tests in this field. One series consists of complicated models which present numerous relations from which other relations are to be inferred. Another consists of cardboard diagrams each containing written descriptions of the relationships. The testee is required to answer a set of questions about each diagram which involve the explanation of the way various parts of the depicted mechanism work. A third series is called mechanical explanation and completion in which the diagrams are incomplete, the problem being to complete the diagram by drawing in parts so as to show how some given mechanical arrangement could be brought about. Reliabilities are quite high for tests of this type, being around .70 to .80 for different subtests. It has the disadvantages of being difficult to administer and score. So far norms are not very adequate and the entire set made up of aluminum costs approximately \$107.00. Most of the tests can be administered to groups, but some are individual. The author finds a unitary factor to account for all the subtests of the battery which is independent of intelligence.

The Detroit Mechanical Aptitudes Examination contains eight subtests: tool recognition, motor speed (dotting), size discrimination, arithmetic fundamentals, disarranged pictures, tool information, belt and pulley movements, and classification. Retest reliability for the seventh and eighth grades is .76. Shop ratings of mechanical aptitude correlated .64 in two independent studies. The difference in the averages of a technical compared to an academic high school was more than three times its own standard error. Other tests could be given in the category of information tests, such as the Stenquist Mechanical Aptitudes Test (not to be confused with the Assembly tests bearing a similar name) and the O'Rourke Mechanical Aptitude Test, but to call them aptitude tests is to seriously confuse acquired knowledge with inborn capacity. If an aptitude test is to be of value it must not be sensitive to differences in

training for otherwise there is little object in testing if it is assumed that everyone can acquire the skill with approximately the same amount of training.

In the third category, muscular accuracy and coordination, should be placed the first three tests in the MacQuarrie battery. Sometimes the O'Connor Finger Dexterity and Tweezer Dexterity tests are mentioned here. Finger control and coordination is required and may be important in some mechanical work. Other peg boards, performance tests, and the Minnesota Rate of Manipulation Test could be included. They all measure a muscular skill rather than a mental aptitude. The Two-Hand Test, also known as the Wisconsin Test of Engine Lathe Aptitude, requires fine coordination among the eyes and the two hands. The task is to guide a pencil which is controlled by two hand screws and thus copy a pattern placed on a platform. A correlation of .42 between scores on this test with quality of lathe work in an engineering college has been reported.

Measuring Clerical Aptitudes. Most of these tests exist in battery form and measure speed and accuracy of various tasks similar to those found in general clerical work. The General Test for Stenographers and Typists developed by the U. S. Civil Service Commission was released in 1935 for general use. In 75 minutes it samples practical judgment, vocabulary, English usage, spelling, and reading comprehension. Although not strictly an aptitude test because it overlaps with intelligence and achievement a great deal, it does have high prognostic power and the norms are particularly adequate. Correlated with efficiency ratings the validity is about .75. The Minnesota Vocational Test for Clerical Workers is a number-comparison, word-comparison checking test which is widely used. Validity is high in that the test discriminates well between the general population and groups of skilled office and clerical workers, and accountants. O'Connor has a similar test which he calls a measure of accounting aptitude. Moore (Herbert) has revised the National Institute of Industrial Psychology Clerical Test for use in America. It contains a number and name checking section and six others: oral instruction, classification, arithmetic, copying, filing, and problems. Its sampling of various clerical abilities is much greater than either the Minnesota or O'Connor tests, and on theo-

retical grounds should be more valid. However, no specific data are available on this point. Retest reliability is .87. The O'Rourke Clerical Aptitude Test, Junior Grade, has two parts: Reasoning, and Clerical Problems. The first part measures ability to read and follow directions, information, congruity and incongruity of words in sentences, spelling, and reasoning in the solution of problems. The second part measures alphabetical filing, comparison of names, addresses, and numbers, classification, and simple arithmetical computation. Validity and reliability data are not reported. The Scott Company File Clerk Test has two parts: checking and comparing data for errors and omissions, and filing numbers and names. It correlates .82 with supervisors' ratings. The Detroit Clerical Aptitudes Test is intended for ages 10 to 16, or for high school. The eight subtests measure rate and quality of handwriting, rate and accuracy in checking, arithmetic fundamentals, motor speed and accuracy, commercial vocabulary, disarranged pictures, classification, and alphabetizing. Correlations of .56 with bookkeeping, .37 in shorthand, and .32 in type-writing are reported. Retest reliability is .85. The most common criticism is that it is more of an intelligence and speed test than a clerical aptitude test.

Measurement of Art Aptitude. No analytical study has been made so far to determine the constitutional nature of art ability. It probably consists of several abilities in unequal degrees, with one or two being dominant. The McAdory Art Test is a judgment test consisting of 72 plates, each containing four illustrations which are variations of the same object, such as furniture, utensils, clothing, architecture, painting, shape and line arrangements, dark and light masses, and color. The testee is required to rank the four objects on each card in order of merit. The criterion is the consensus of opinion of several recognized artists, art critics, and art teachers. No practical validity coefficient has been reported. Reliability averages about .85. Another judgment or appreciation test is the Meier Art Judgment Test, a revision of the Seashore-Meier Art Judgment Test. The principle is that of paired comparisons in which there are 100 plates each containing two pictures of the same painting. One of the pair has been altered slightly from the original masterpiece in such a way that it is universally judged

to be inferior by recognized artists. Validity is controlled by (1) a critical reaction by 25 art experts, and (2) by a 60-90 percent preference by 1,081 subjects. Whether any judgment test is capable of measuring an ability to perform or not is open to doubt. In the musical field, at least, the relationship is not necessarily high, or if it is high it may not be reciprocal, that is, high ability will be significantly correlated with appreciation, but high appreciation may not be nearly so highly correlated with superior functional ability. The Knauber Art Ability Test consists of 17 "Problems" as follows: (1) copying from memory a design exposed for one minute, (2) drawing Santa Claus from past memory only, (3) copying a small design by enlarging it to fit a space $2\frac{1}{2}$ times larger, (4) drawing a table in a given space without benefit of a design, (5) drawing a cup in saucer same as in 4, (6) drawing three trees, a cottage, a path, and anything else desired in a given space, (7) drawing a church at foot of mountains to give a feeling of reverence, (8) detecting misplaced or incongruous details in a series of six drawings, (9) filling in shadows in two unshaded pictures, (10) filling in one geometrical and one pictorial design each with shadings appropriate to the masses, (11) drawing a monogram in a circle and (12) also in a triangle, (13) ingenuity of design, (14) imagination in geometrical design, (15) changing a given drawing of a man to represent a different character from the one given, (16) drawing a "homeless dog" for ability to express an emotional idea, and (17) drawing something symbolic to represent labor. The test is very complete and takes about three hours to take. There is no doubt about its value as an achievement test, but to what extent it is an aptitude test is not clear. It differentiates between art majors and non-art majors and between art teachers and non-art teachers with great decisiveness, but this could still be largely on a training basis, the same as any achievement test. If it could be demonstrated that at least 50 percent of the score variance is due to innate ability this would still be a fair aptitude test except that one must be able to draw quite well before he can even take the test. Retest reliability is over .90. The Lewerenz Tests in Fundamental Abilities of Visual Art measures (1) recognition of proportion, (2) originality of line drawing, (3) observation of light and shade, (4) knowledge of subject matter, (5)

visual memory of proportion, (6), (7), (8) analysis of problems in cylindrical, parallel, and angular perspective, and (9) recognition of color. These items appear to sample judgment, appreciation, information, and aptitude factors in unknown amounts. A correlation of .63 was obtained with grades for 42 art students. Retest reliability is .87. The Selective Art Aptitude Test by Varnum not only attempts to measure talent for art in general but also to specify what field of art one has aptitude for. The test is divided into three parts, called Groups. Group A measures fundamental abilities through three tests of acuity of vision, color harmony, and tone gradations. Group B measures sensitivity through two tests of proportioning and balance and rhythm. Group C measures creative ability through two tests of speed under creative stimulus, and creative imagination. The test is still in a tentative stage and the manual needs a thorough revision to make it either intelligible or useful. No validity coefficients are given but validity is discussed over several pages by citing individual cases or small groups, and presenting statistical tables which are not very meaningful. If its validity can be established it should be a most useful prognostic test because it does not draw heavily upon actual achievement in drawing. Reliability is somewhat low, .66 to .83 for the whole test, split half method, corrected. It is not significantly related to intelligence or to the Meier-Seashore Art Judgment Test.

Measurement of Shorthand Aptitude. The Turse Shorthand Aptitude Test contains seven parts known as stroking, spelling, phonetic association, symbol transcription, word discrimination, dictation, and word sense. It can be given before one has started the study of shorthand and has a correlation of .67 with a standardized achievement test in shorthand. Split-half reliability is over .90. The Bennett Stenographic Aptitude Test consists of two parts, a learning substitution section and a section of misspelled words to be identified and respelled. It can be given before one has started the study of shorthand. A biserial r of .27 with grades in a secretarial school was obtained with the substitution section and .48 with the spelling section. Reliability coefficients are .97 and .91 respectively. Part of the power of this test is due to its overlapping with intelligence to the extent of r .27 for the first section and .62 for the second section, as measured by the Army Alpha. It is also

an achievement test due to the spelling section although the same correlation is reported (.47) for experienced as for inexperienced (practiced) groups.

Measurement of Medical Aptitude. The Moss Aptitude Test has been used for more than a decade by members of the American Association of Medical Colleges. It consists of six parts called (1) comprehension and retention, in which a difficult paragraph from a medical text is presented to the testee to read and study for 15 minutes after which he is given a true-false test on the content, (2) visual memory, in which some detailed anatomical diagram is shown the testee for 15 minutes after which he is given another similar diagram and required to fill in the missing labels, (3) memory for content, (4) logical reasoning, (5) scientific vocabulary, and (6) understanding printed material. A new form is published each year. It will be seen that this is not strictly an aptitude test since it is largely a generalized learning test for difficult material. To a large extent it is an intelligence test, and in some ways it is an achievement test for premedical material. When test scores are compared to medical college grades it has been found that only five per cent of those in the highest decile failed, while thirty per cent who scored in the lowest decile failed. When test scores were compared to ratings of internes it was found that those who scored above 200 on the test received an average rating of 1.8 on a five-point scale, while those scoring below 100 received an average rating of only 2.3. Correlations are not given but it is doubtful if they would be over .50 for such data, which is fair but not good for a validity coefficient. Reliabilities are not given. The test is not available for general use but is sponsored by the American Association of Medical Colleges and given only to those who expect to apply for admission to a medical college. The test results are not made available to the testee.

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ASPIRATIONS, LEVELS OF.—In recent usage, level of aspiration usually designates goal-seeking behavior of the type where behavior operates under cognitive influences. More rarely the term refers to behavior involving uncomplicated forms of *felt* urges and drives. For the former sense of the term, as with "ambitions" in general, drives are modified by such factors as the subject's estimate of his own capacities, his knowledge of the attainability of the goal, and other potentially cognitive factors.

Beginning with F. Hoppe's initial studies, a fruitful and growing amount of experimental work, chiefly that of K. Lewin and his associates, has been devoted to this area. Such research has been directed chiefly to the study of the *quasi* and somewhat artificial needs resulting from an experimentally formulated *Aufgabe*. Quasi-needs are typically less intense than the real and more permanent needs of the subject. It is argued that weaker needs still follow the same laws as stronger ones, to the point where increased strength induces structural changes of personality. Hence, research on quasi-needs should yield sound and practical information in the field of motivational psychology.

Some of Hoppe's chief findings were: that the subjects' experiences of success and failure are consequences, not so much of the absolute goodness of the performance, but rather of attainment or non-attainment of the level of

aspiration. Subjects tend to lower or raise future goals depending on their successes and failures with previous goals. Experiences of success and failure do not attend tasks which are too easy or too difficult. Hoppe inferred that levels of aspiration are chiefly determined by two sets of opposing principles in the individual: (a) *ego* forces which tend to set high goals even at the cost of failure, and (b) *pleasure* principles which seek successes, thus lowering the aspiration level.

Since Hoppe's work, research has been directed towards (a) improvements in experimental techniques, and (b) the attainment of quantitative measurements of levels of aspiration and performance, and the correlation of such measures with various aspects of personality and behavior.

Experimental Techniques. An important endeavor has been to select tasks in which level of aspiration, change of level, and goodness of performance are measurable in terms of the same units (J. D. Frank). The other important phase of development of procedure consists of attempts to define and control situational and personal factors involved in research. Discussion of the latter aims is covered in the following review of the conditions and correlates of aspiration.

Conditions and Correlates of Aspiration. As regards field conditions, the effects of barriers and frustrations have been given leading attention. Variant forms which barriers may take are defined (see K. Lewin and H. F. Wright). Objective field barriers are distinguished from social (prohibitions, customs) and personal barriers (dislikes, scruples, etc.). *Means* to an end may be regarded as true barriers, and barriers may be regarded as means to an end. Barriers are such only so long as they can be overcome—beyond this point they become field-limiting factors (Lewin), resulting in the cessation of striving or in substitute responses. Experiments (of Wright and others) are offered to indicate that barriers tend to enhance personal positive valences (attractions) even where equivalent goals with less barrier are available. However, where subjects make selections for others the line of least barrier is pursued, unless there is identification between the subject and the person whose goal-objects are being selected. The principle of parsimony (use of the means with least barrier) thus tends to cancel the effects of

barrier-enhancement, and becomes prominent when alternative goal-objects and means towards them become identical. Satiation tends to neutralize valence-enhancement due to a barrier. Barriers to goals tend to enhance attendant memory traces (Zeigarnik and others).

Theoretical attacks on the question of the mechanisms of barrier-enhancement of goals are on record. One view (Wright) holds that any goal-object releases energies which accumulate in situations involving barriers—the subjective correlate is that of a growing attraction of the object. It is possible that valence-increase is relative—that the object with least barrier may decrease in valence rather than that the object with greater barrier shows valence increase. Another view (H. Lundholm) holds that barriers cause means-energies to drain to other organic areas resulting in emotional intensification and hence increased awareness of the desirability of the object. Barriers causing the experience of frustration are assumed by many to generate emotional states (Conflict theories of emotion—John Dewey, F. A. Hodge, C. W. Darrow). An alternative solution of situations involving strong frustration is to resort to substitute activities, such as sublimation, transference of affect, displacement, regression, vicarious satisfaction (K. Lewin, M. Henle).

Various traits of personality have been studied as correlates of aspiration level and derived concepts. Thus, excess of aspiration level over performance is moderately associated with narcissism, aggression, emotionality, introversion (J. D. Frank). Significant and practically useful relations between reaction to frustration and academic achievement are suggested (R. P. Fischer).

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ATTENTION.—Attention, for the psychologist as for the layman, designates a group of phenomena that center around selection of objects and aspects of objects and of memories. Of all the sensory stimuli that present themselves and of all the memories that might be suggested only one is noted. When several stimuli combine to form an object, one will be more clear than the others. The phase or object that will be noted varies from moment to moment. The attention experience also includes the contraction of muscles which give rise to sensations of strain. These contractions arise automatically at the time of vigorous strivings, as in lifting a weight, in making a serious decision, or in holding one's self to a task when tired or attracted by a more pleasant activity. The incidental strains have popularly been taken as an indication of activity and called effort. On the other hand when attention runs smoothly a feeling of pleasure is present. This is usually called interest and is sometimes confused with attention or regarded as a cause of attending.

While it is universally appreciated that selection is always present, some have questioned recently whether the process is unique enough to deserve a separate name. The various elementary processes assigned to attention have been separated and grouped in different ways. One fairly recent grouping of this kind has been made by the Gestalt psychologists. They are most struck by the alternating clearness of different phases of an object. Objects of ambiguous perspective, such as three steps with little decrease of size in the upper and lower lines can be seen either as steps or as a projecting cornice. Figures of irregular outline in massed black and white may be seen either as white on a black ground or as black on a white ground. Studied for a time the perspective interpretation of the lines will shift regularly, the near parts will retire and the far parts approach and vice versa at regular intervals. Similarly the white parts of

the figure in black and white may be prominent at one time and the black portions at another. Rubin gave the name of "figure" and "ground" to the two parts, and spoke of "becoming the figure" as the equivalent of clearing up in attending. Following this usage the Gestalt school regard attending as a change from ground to figure, and would use figure and ground as a name for the selection process. Linguistically this is inconvenient for no one, not even the believers in the theory, speak of figurizing as a substitute for attending.

Wittenborn¹ has demonstrated experimentally and statistically that a group of elementary factors exist that agree with what is popularly called attention. He gave 175 men certain of the standard tests that involved continuous effort with strain. He also gave the same men certain tests that he prepared himself. The new tests required recognizing certain successions of numbers and letters as a series was presented. He applied to all his results the Thurstone methods of factor analysis and found that two of his own tests were specially loaded with the attention factor. Others of his own and standard tests showed a slighter loading. This statistical treatment indicates according to Wittenborn that attention should be counted among the simple factors. He regards continuous effort as the phenomenal characteristic most prominent in the attention complex. The method reinforces direct observation in demonstrating the presence of a group of phenomena corresponding to what is popularly known as attending.

•The more important phenomena in the attention group that have been measured are the range of attention or the number of objects that may be appreciated simultaneously, the duration of attending, or the length of time that a single stimulus may be held clear, and the effects of distraction. Measurements of the range of attending were among the first made. Jevons and Hamilton made crude measurements early. Cattell devised the tachistoscope to give a brief exposure of designs on cards. Results show that there is an increase in the percentage of correct enumeration as the number of items decreases. With four dots near 100 percent correct responses are given. The more complicated the objects the fewer can be enumerated. Objects with meaning can be reported

more accurately than meaningless material. Almost as few errors are made with short words as with dots or single letters. Assuming that 50 percent correct answers is a measure of the number that can be seen, results of three investigations indicate that the range of attention varies between 6.2 and 11.3. Grouping simple objects increases the number that can be seen. Almost as many triangular groups of three dots can be seen as single dots. Letters arranged in small words are seen more accurately than the same number of single letters. Observation of the procedure in observing indicates that the number of items that can be seen depends upon the memory after-image. The objects persist for a second or so after the exposure and they are counted in this image.

The length of time that an object may be attended to has been studied for faint stimuli by a method similar to that used in the work on figure and ground mentioned above. If faint gray lines are produced by rotating a disk with a series of small squares extending from the center to the circumference of the disk, a ring may be chosen that will be seen for a time and then disappear. These fluctuations are regarded as due to changes in the efficiency of the visual mechanism. The complete cycle ordinarily has a length of from one to five seconds. The relative lengths of the periods of visibility and of invisibility varies with the distance of the particular equal squares from the center. The more distant from the center, the greater the proportion of white to black. The fainter the stimulus, the shorter is the period of visibility. It is probable that the periods recorded are longer than the real wave because some shifts are overlooked. Each record also involves two shifts—one the real shift, the other the shift from the disk to the act of recording. Billings, recording all shifts, found an average of about a second from one point of maximum clearness to another. On occasion the shifts came as close together as 0.1 sec. to 0.2 sec. The minimum approaches the refractory period of the nerve. These fluctuations appear in listening to faint sound, in the alternate interpretations of ambiguous perspective, in the alternate dominance of the two eyes when each is stimulated by contrasting colors, and according to Bills in the efficiency of motor work.

• Distraction is the supposed reduction in efficiency as a result of a second stimulus or activ-

¹ Wittenborn, J. R., "Factorial Equations for the Tests of Attention," *Psychometrika*, 1943, 8, 19-35.

ity. Experiments show that the effect of a second stimulus is the reverse of that assumed, since the second stimulus increases rather than decreases the efficiency of performance. If a loud sound is given when one is adding, adding is quicker and more accurate on the average than when silence prevails. Morgan and Ford recorded the strength of incidental movements during adding with and without the noise and found that muscles contract more strongly during the sound and relax when it ceases. They have urged that this means that greater exertion of the body-mind processes is present during a distraction, and more effort than is necessary to overcome the distraction, so that more is accomplished with than without the noise. It is probable that the increased performance is at the expense of greater fatigue. Studying while listening to the radio may be more effective while studying dominates, but the average performance is reduced by the period when the radio dominates.

The antecedents of selection or of the increased clearness of different classes of material give some indications of the cause of attending. Most frequently mentioned and probably most important for theory is a task that has been set for the observer or one that he has set himself. If one has been asked to mark the verbs on a page, one will have no idea of what has been said by the words. If one is asked to say which is the higher of two tones and then later is asked which had the greater duration, he will not be able to say. The task may be set by one in authority or may be suggested by what has gone before. When the questions arise from the context, they may be specific as a definite question for which an answer is sought or may be more general. If general they prepare to see anything in a class. 'Hunger leads one to look for a restaurant sign or to smell food of any kind. A remark about art will lead one to notice paintings on the wall. In the ordinary course of the day one task suggests another, so there is a continuous ordered series of problems that controls behavior logically.

The purposes or tasks themselves are organized by experience and education. This gives earlier training an influence upon what shall be selected. Many of the more fundamental tendencies to attend go back to the modification of the nervous system in the evolution of the race. One is alert to all objects that may affect the

survival or well being of the individual, to water when thirsty, to a moving or changing object at all times, to harsh tones or threatening gestures, to members of the opposite sex and so on. These may be called the conditions of attending. The inherited ones go back to the nervous system. Animals that develop nervous systems that respond preferentially to objects that are dangerous or especially beneficial survive in greater numbers and tend to transmit the change to their progeny.

A word may be given to the question of the need for attention as a word or concept in psychology. If one means by attention a force or any kind of entity, then the answer would be no and the same answer would be given for the need of memory, emotion, will, perception and the rest. If one thinks of the concepts as convenient points of reference for a group of related phenomena, one can answer that the term is convenient for reference to a group of events, that have much in common in their conscious quale and in the function that goes with them. The objection to such terms is found in the tendencies to assume that a single cause or faculty lies behind them or that each constitutes a single entity. One is bound to deal with such groups of experiences as units and a word to designate them is bound to develop. The scientist must become accustomed to avoiding implications of entities. Thus attention can be used to designate the selective phenomena of consciousness and the differences in clearness of objects, as well as the narrowness of the range and the alternations in clearness. One must avoid assuming that attention is a force that produces these changes. On the factual side one can relate the changes to recent other experiences, but exercise reserve in asserting a causal relation. One can speculate that the nervous system mediates between the two groups of phenomena if one sees that present knowledge of the nervous system is insufficient to say just how.

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AUTONOMIC NERVOUS SYSTEM.—

1. *Definition.* The term autonomic nervous system is used to designate the sum total of nerve fibers which supply the visceral organs with motor and secretory impulses, these organs being the glands, the smooth muscles, and the

heart. The division between the autonomic and central nervous systems is functional and not anatomical because some of its neurons lie in part within the cerebrospinal nervous system.

2. *Anatomy.* The autonomic nervous system may be subdivided into the cranial autonomic nervous system, whose fibers make their exit by way of the third, seventh, ninth, tenth, and eleventh cranial nerves; the thoracolumbar nervous system, whose fibers make their exit by way of the upper lumbar spinal nerves; and the sacral autonomic nervous system, whose fibers run in the visceral rami of the second, third, and fourth sacral nerves. The fibers of the thoracic columnar stream run by way of the side rami through the sympathetic side chain of the spinal cord, while the fibers of the cranial and sacral stream make no connection with that trunk but run directly to the peripheral nerve plexus ending in the terminal ganglia within the visceral organs. The cranial and sacral systems also agree in their response to certain drugs like atropine and adrenalin. It was therefore found desirable to group the cranial and sacral system together as the cranio-sacral autonomic system, often called the parasympathetic system, to be contrasted with the sympathetic nervous system proper, a name now applied to the thoracolumbar part of the autonomic nervous system. Most of the structures innervated by the autonomic nervous system receive a nerve supply from each of the subdivisions.

The sympathetic side chains or trunks are two large cords which extend through the neck, thorax, and abdomen, and run along each side of the vertebral column. They are composed of a series of ganglia, arranged in lines and connected by short nerve strands. These cells are connected with the spinal cord at each segment by one or more gray rami communicantes through which impulses reach the spinal cord from the sympathetic trunk. Impulses reaching the trunk from the spinal cord travel from the thoracic and upper lumbar nerves to the sympathetic ganglia by way of the white rami communicantes. Towards the periphery the sympathetic trunk gives off branches which form nerve plexuses in close proximity to the large arteries. The most important of these plexuses is the celiac plexus, found near the upper branch of the abdominal aorta, containing the celiac, mesenteric, and the aorticorenal ganglia.

There are, finally, terminal ganglia located close to or within the structures they innervate, as, for instance, the ciliary ganglion for the eyes, the cardiac ganglion for the heart, and groups of nerve cells within the walls of the intestines.

The vast majority of the functions of the autonomic nervous system are efferent functions. For some time it was doubted that afferent fibers could be demonstrated, but it is now established (Chase and Ranson, 1914; Ranson and Billingsley, 1918) that visceral afferent fibers run in the ninth and tenth cranial nerves; also in many spinal nerves, especially in those associated with the white rami communicantes; and finally in the second, third, and fourth sacral nerves. These nerves run to the viscera without interruption in any of the sympathetic ganglia.

The efferent visceral neurons are all interrupted before they reach the structures they innervate. The first neuron terminates in the sympathetic ganglia, where the nerve impulses are relayed to the periphery by secondary neurons. Langley, in 1900 and 1903, showed that there are always two and never more than two neurons conducting nervous impulses from the central nervous system to smooth muscle and glandular tissue. This could be demonstrated by the injection of nicotine into rabbits, which prevents the passage of impulses through the sympathetic ganglia. After such an injection, an undiminished response of the end organ can still be obtained by stimulation of the peripheral (postganglionic) sympathetic nerves, but it will no longer respond to stimulation of the central neuron leading to the ganglion. Preganglionic neurons start from cell bodies in the anterolateral column of the spinal cord. The fibers have a myelin sheath. They run through the cerebrospinal nerves to the sympathetic trunk, and terminate in its ganglia. The postganglionic neurons start from cells located in these ganglia and axons, remain for the most part unmyelinated, and make up the sympathetic nerves and plexuses to and in muscle and glandular tissue.

There are, then, three kinds of fibers in the autonomic nervous system: (1) preganglionic efferent fibers of small size and myelinated, terminating in the sympathetic ganglia; (2) postganglionic efferent fibers, mostly unmyelinated, terminating in involuntary muscle and glandular tissue; and (3) visceral afferent fibers,

containing both myelinated and unmyelinated fibers, connecting the cerebrospinal ganglia and the viscera. The chief pathways of efferent innervation of the viscera are as follows: contraction of the pupil and accommodation are furnished by the craniosacral division via the ciliary ganglion; dilation of the pupil is effected by the thoracolumbar division via the superior cervical ganglia and the internal carotid plexus. The salivary glands are stimulated to secretion by fibers from the craniosacral division through the seventh nerve and chorda tympani; while the secretion is inhibited by fibers from the thoracolumbar division via the superior cervical ganglion and plexuses on the external carotid artery. The heart is inhibited by fibers from the craniosacral division through the vagus nerve and accelerated by the thoracolumbar division through fibers via the cervical and upper thoracic sympathetic ganglia. The stomach is excited to peristalsis and secretion by the craniosacral division via the vagus nerve; it is inhibited by the thoracolumbar part through sympathetic fibers via the celiac plexus. The bladder is excited to contraction and to relaxation of the sphincter by the craniosacral branch via the second and third sacral nerves. The sphincter is contracted for the retention of urine by the thoracolumbar branch through sympathetic fibers via the inferior mesenteric ganglion.

The blood vessels, particularly the small arteries of the skin and skeletal muscles, are innervated solely by the sympathetic division. The coronary, pulmonary, and probably also the cerebral and intestinal blood vessels have an additional nerve supply from the parasympathetic division, the latter being dilator, the former constrictor. Removal of sympathetic fibers results in marked dilation of blood vessels of the skin with rise in skin temperature. Sympathetic excitement leads to blanching of the skin and fall in skin temperature. A striking shift in circulating blood from the visceral to the peripheral area occurs during vigorous muscular exercise and after severe hemorrhage.

The sweat glands are innervated by sympathetic postganglionic fibers. Sweating commonly accompanies peripheral vasodilation for the purpose of heat loss, but it may also occur with vasoconstriction (cold, clammy hands). The sudomotor sympathetic fibers in contrast to vasomotor fibers, are cholinergic.

The endocrine glands are under direct control by the autonomic nervous system. In addition to the adrenomedulla excited by sympathetic fibers, the anterior pituitary gland receives sympathetic fibers through the carotid plexus and also parasympathetic fibers from the Vidian ganglion. The thyroid gland is known to have vasomotor innervation, but there is no direct proof so far of a direct secretory innervation. Parasympathetic stimuli reaching the pancreas stimulate the islands of Langerhans to secrete insulin.

The control of the respiratory system is complicated. The respiratory center in the medulla oblongata regulates respiratory rate and amplitude. It is sensitive to changes in oxygen and carbon dioxide tension and also to the influence of afferent fibers in the vagus nerve. And, finally, it is controlled through impulses from the wall of the aorta at the carotid artery (carotid-sinus reflex). The smooth muscles of the bronchial tubes receive parasympathetic fibers from the vagus nerve and become contracted through parasympathetic impulses. They may be dilated through sympathetic stimulation.

The reproductive organs receive vasodilator parasympathetic fibers for the engorgement of erectile tissue and stimulation of secretion in prostate and vagina, but the uterus seems to receive sympathetic fibers only.

3. *Historical.* The autonomic nervous system is sometimes also called the involuntary or the vegetative nervous system. Occasionally one also hears the term sympathetic nervous system, but in present usage this term describes only one part of the autonomic system. The term sympathetic goes back as far as Galen. He thought that the junction of peripheral nerves connecting the various viscera might permit animal spirits to flow from the brain to the organs and from one organ to the other. This to him explained the fact that in case of disease of one organ, symptoms often appear in another part of the body also: suffering with one another.

The Danish anatomist Winslow, 1732, gave the name "grand sympathique" to the chain of ganglion cells running along the spinal cord because it seemed to bring into sympathy various remote parts of the body. Even earlier Willis, 1664, had introduced the concept of involuntary movement (of the viscera) as op-

posed to the voluntary movement of the skeletal musculature.

The term vegetative nervous system was first used by Reil in 1807. At that time, under the influence of Bichat, 1800, it was thought that the autonomic system was completely independent from the brain and spinal cord. It was supposed to be responsible for "la vie animal" while the brain and spinal cord were responsible for "la vie organique." This distinction is still preserved in our present terms of vegetative system as contrasted to somatic nervous system.

The 19th century brought the discovery of the unmyelinated structure of sympathetic fibers (Remak, 1838), of the discovery of such fibers in the walls of blood vessels (vasomotor fibers, Claude Bernard, 1851), and there followed studies of the effect of the vagus nerve on the heart and of the chorda tympani on salivation. Gaskell, 1885, finally reestablished the connection of the cerebrospinal system and the autonomic nervous system by tracing the course of non-myelinated fibers from the spinal cord to the sympathetic ganglion cells. He also postulated the existence of two opposing systems for the control of visceral motility and glandular secretions.

The term *autonomic* was first used by Langley, who in 1893 started his work on the effect of nicotine on the transmission of nerve impulses in autonomic ganglion cells. He traced the exact distribution of "preganglionic" and "postganglionic" nerves by observing whether or not application of the drug blocked the progression of impulses through a given ganglion. He used the term *autonomic nervous system* to include the outflow of nerves in the cranium, thoracolumbar, and sacral regions. In 1905, he subdivided these outflows into the "sympathetic," comprising the thoracolumbar division, and the "parasympathetic," comprising the cranial and sacral outflows, because the latter two agreed in their reaction to drugs.

Although the claim has been made that the autonomic nervous system is phylogenetically older than the cerebrospinal system, there is no embryological evidence to show that the autonomic nervous system appeared earlier than the central nervous system. Throughout the whole series of vertebrate animals, both systems appear together, function in intimate relationship, and are equally important. In human beings,

the highest functions of integration for the autonomic nervous system lie within the brain itself.

In trying to circumscribe the functions of the autonomic nervous system as a whole, Cannon came to the conclusion that in contrast to the cerebrospinal system, which deals with the outer environment (is exteroceptive), the autonomic nervous system deals with the domestic affairs of the interior of the organism as an interoceptive system. When the activity of the cerebrospinal nervous system alters the fluid matrix of the body, the autonomic nervous system, through its sympathetic division, has the function of re-establishing the equilibrium by its interoceptive functions. To this Cannon applied the term "homeostasis."

The observation that stimulation of the autonomic nervous system may bring about the secretion of powerful chemical substances led to a revolutionary reinterpretation of the conduction of nerve impulses. Cannon was able to show that sympathetic excitement is followed by the secretion of adrenalin; this substance then serves to sustain the "adrenergic" effects of the stimulation initiated in the sympathetic system. He was able to show that even at the occasion of sympathetic discharges in the visceral organs, minute quantities of a substance almost like but not quite like adrenalin, called sympathine, appeared. Dale, in 1916, supported by former experiments of Loewi, was able to demonstrate conclusively that stimulation of the parasympathetic section of the autonomic nervous system also leads to the appearance of a substance facilitating and sustaining the "cholinergic" state of stimulation. In this manner the theory of chemical transmission of nerve impulses was developed. Research interest then shifted to the central integration of autonomic activity in the hypothalamus. During intracranial surgery removing pituitary tumors, Harvey Cushing, 1913, has noticed that lesions to the floor of the third ventricle may bring about violent changes in gastrointestinal activity. Fulton and his co-workers, 1929, Ranson, 1939, and Gellhorn, 1943, worked out the precise features of this central autonomic control of visceral activity.

Observations on the role of the hypothalamus after removal of the cortex by surgery led to the theory of the hypothalamus as the central station of control for visceral activity, hence a

prime factor in emotional reactions. Indeed, it became customary to think of the hypothalamus as the central station of control for the emotions. The appearance of an explosive discharge simulating violent rage, which occurs after the removal of the cortex and which resembles the manifestations of violent rage (and therefore called "sham rage"), led Bard, 1928, to support this concept of the hypothalamus. Only recently Masserman, 1941, has questioned this view. By electrical stimulation of the hypothalamus in a living cat, he was able to show that while it is true that certain phenomena accompanying violent emotion such as panting, salivation, wide pupils, and erect hair occurred, together with biting movements of the jaws and unsheathing of the claws, nevertheless, these vivid accompaniments of emotion disappeared at the moment the stimulus stopped and the cat then went on with what it had been doing before the excitation as though it had experienced no stimulation at all. At best this stereotyped activity could only be called "pseudo-affective." Adding to this the evidence that such reactions cannot be conditioned (as is possible with true emotions), the conclusion was inevitable that the hypothalamus is not a center of emotion or of feelings of any kind. It is now conceived of as a motor way-station where emotional expression is integrated into behavior patterns on its way out into the muscles and glands (Cobb, 1943).

The latest concern, stimulated by the war, has been that of traumatic shock. The peculiar alteration in the activity of blood vessels, of visceral organs and glands as it occurs after severe injury or overwhelming emotional stimulation was studied by Cannon during the first World War and became the object of renewed inquiry in 1936 when Selye described what is now known as the "alarm reaction." It was realized that in response to a great variety of noxious agents the organism responds with the same set of symptoms. The reaction might therefore be regarded as a syndrome representing a "call to arms" of the body's defense forces.

This reaction was found to have two phases: the first called "shock" consists of tachycardia, decrease in muscular tone and body temperature, formation of gastric and intestinal ulcers, hemoconcentration, and discharge of adrenalin. After about 24 hours, this is likely to be fol-

lowed by the "counter-shock" phase. Cannon's original notion that one significant function of the interofective system was the maintenance of chemical equilibrium in conditions of emergency was thus validated, and opened the way for studies of great clinical significance.

At the clinical level, our knowledge concerning the autonomic nervous system is becoming rapidly more and more important for the management of psychoneuroses and of those medical diseases which are now collected under the name of psychosomatic disorders. While anxiety neuroses and depressive states present diffuse and widespread alterations in many visceral organs controlled by the autonomic system, the psychosomatic conditions present a regional dysfunction. Specific viscera are involved. We find, for instance, ulcers of the stomach, ulcers of the spasm of a blood vessel in migraine. Regulating the control of the autonomic nervous system either by altering the emotional responses through psychiatry or by altering the autonomic control through chemical agents (internal medicine) or finally by interrupting the autonomic pathways conducting disturbing impulses (surgery and neurosurgery) will be alternate methods of clinical management. A new Journal "Psychosomatic Medicine" is devoted to laboratory reports and clinical studies concerning this field of inquiry.

4. *Physiology.* In describing the physiological functions it seems well to start with Cannon's concept of interofective and exteroofective systems. He summed up the important features of the interofective nervous system in 1932 as follows: "(1) an absorption of extra acid in the buffer substance of the blood; (2) a prompt supply of extra oxygen to burn the non-volatile lactic acid to volatile carbonic acid, which can be rapidly discharged; and (3) an acceleration of breathing so that carbon dioxide is driven away from and extra oxygen is drawn into the lungs. In short, the circulatory and respiratory mechanisms work at their maximum capacity. Once more the sympathoadrenal system steps in to save the fluid matrix from grave disturbance. The circulatory adjustments . . . constriction of the splanchnic vessels . . . acceleration of the heart, discharge of extra corpuscles from the spleen . . . are all made by means of the sympathoadrenal system. And, in addition, this system probably plays a role in facilitating the respiratory processes, for it can quickly and

effectively cause dilation of the bronchioles and thus reduce the frictional resistance to the to-and-fro movement of the respired air."

The role of the thoracolumbar division of the autonomic nervous system may then be thought of as an emergency system which may not be functioning all of the time but which is always ready to go into action under adverse conditions. Some of these are pain, extremes of temperature, asphyxia, hemorrhage, infections, dehydration, and low blood sugar, and finally—most important of all—intense emotion or psychic trauma. The attending changes in the fluid matrix of the body may become harmful and distressing if the emotional stress is not followed by the appropriate action. The effect of autonomic stimulation is catabolic and brings about liberation of body energy. The parasympathetic division of the autonomic nervous system has an anabolic character, conserving energy during rest and recuperation. Flow of saliva and gastric secretion, heightened motility of the intestines, facilitate digestion and assimilation of food. The heart muscle is afforded rest by the reduced heart rate brought about through vagal stimulation.

The largely antagonistic functions of the two divisions of the autonomic system have formed the basis for dividing individuals into vagotonic and sympathicotonic types. While it is true that the two great systems which integrate the circulatory, respiratory, digestive, and genito-urinary functions are in a state of mutual balance, at times either one special viscus separately or all the viscera simultaneously may be influenced in one direction or the other; for instance, the heart beat may be accelerated as part of emotional excitement, together with sympathetic stimulation of all the other viscera, or the heart may beat rapidly as the result of lessened vagal inhibition without simultaneous change in the activity of the other organs.

Animals which have been totally deprived of sympathetic activity by having had the paravertebral ganglia from the neck to the lower lumbar regions removed become vulnerable to cold, have markedly reduced ability to perform muscular work, and lose the hair-raising power. The peripheral arteries lose their tone only temporarily, heart rate and blood pressure show only slight changes, and there is no tendency towards clear-cut vagotonia. In a protected constant environment the animals are little im-

paired but are markedly hampered in meeting the stress of changing circumstances. They would be in constant danger of disaster unless action were taken to correct the conditions to which the autonomic nervous system adjusts in a purely automatic fashion.

It is important to add observations about the chemical reactions within the autonomic nervous system. It is a fundamental fact that excitation in the autonomic nervous system may be sustained by chemical agents which are produced in the body, namely adrenalin for the sympathetic or adrenergic, and acetylcholine for the parasympathetic or cholinergic. Much information about the autonomic nervous system has been gained by studying the reaction of animals to these substances. Clark (1938) gave a detailed pharmacological description of the effect of these substances in man. The most important adrenergic substances are adrenalin (epinephrine), sympathin, benzedrine; and the most important cholinergic are acetylcholine and pilocarpine. Inhibitors of the sympathetic system are ergotoxin and nicotine. Inhibitors of the parasympathetic are atropine and nicotine.

5. *The Effect of Chemical Agents and Clinical Applications.* The autonomic neurological examinations in the clinic are less developed than are those of the cerebrospinal system. The clinical manifestations of vigorous stimulation of the autonomic system can best be demonstrated by the injection of adrenalin and acetylcholine. Such injections are followed by a characteristic picture. Sympathetic stimulation (or adrenalin injection) results in increased heart rate, heightened blood pressure, dry mouth, elevated blood sugar, increased leucocytosis, tremor of the extended hands, sweating palms, and pallor of the face. Parasympathetic stimulation (or acetylcholine) is followed by sweating of the body except for the hands and feet, salivation, labored breathing, increased heart rate, lowered blood pressure, flushed face, and subjective complaints of feeling hot, light-headed, and dizzy.

It is of interest that the rate of activity during interviews with the clinician is markedly different when the patient has been stimulated or has been given acetylcholine. Injection of the former is followed by an inhibited, uncommunicative stage; after the injection of the latter subjects are liable to speak freely, rapidly, and with little reticence.

Drug therapy of states of autonomic instability has been carried out with both stimulant and depressant substances.

By far the most important of these drugs is adrenalin, which is secreted by the chromaffin cells of the suprarenal gland. These cells are innervated directly by preganglionic neurons as though they were analogous to the ganglion cells of the post-ganglionic neuron. Its active principle is $C_6H_5(OH)_2CHOH.CH_2NHCH_3$. It is known as adrenalin to the medical profession and as adrenin to the physiologists when they refer to the actual secretion in the gland. The effects are identical with a widespread discharge in the sympathetic system except that sweat glands are not stimulated. The point at which it produces its effect is even now not exactly known. It obviously does not act directly on the sympathetic nerves because its action persists when these nerves have degenerated. It also does not directly affect the contractile mechanism of smooth muscles (Dale, 1906). Probably some intermediate substance between the nerve endings and the contractile mechanism is involved. Cannon (1937) has described this as the neuro-effector mechanism. When very small amounts of adrenalin are given there may be reversal of the effect. For instance, a moderate amount will produce constriction in the small blood vessels of the skin; a very small amount, however, will bring about vasodilation. This difference is due to the fact that the substance affects not only the vasoconstrictor mechanism but also the vasodilator. The constrictor mechanism is more powerful and has preponderance unless it is paralysed by ergotoxin. Injection of adrenalin after ergotoxin produces vasodilation sufficient to cause a fall in blood pressure.

The word sympathin has been applied by Cannon (1921) to a substance which seems to be produced at the junctions of sympathetic nerves with smooth muscle cells. It has effects much like adrenalin but elevates the blood pressure after ergotoxin. Out of this substance may be separated two fractions, one an excitor, the other inhibitory; their formulae are still unknown.

Closely related to adrenalin chemically are ephedrine, benzedrine (amphetamine sulphate), and mescaline. While ephedrine is largely used for its peripheral effects, causing changes similar to adrenalin but more lasting and effective

even when taken by mouth, benzedrine, in addition to mild peripheral adrenergic effects, shows a marked action on central nervous system functions (Myerson, 1936). It has been used to reduce mood depression and also to counteract the depth of surgical anesthesia and the effect of over-doses of barbiturates (Michelson, 1939).

Ergotoxin (Dale, 1906) paralyses the excitor action of sympathetic nerves. Like adrenalin it acts on the intermediate substance between the nerve endings and smooth muscle cells. Its power to relax vasoconstrictor tone is used to combat migraine.

Nicotine, the alkaloid of tobacco, stimulates the activity of the sympathetic junctions in the ganglion cells of the autonomic nervous system when given in small amounts but is paralysing in larger amounts.

Powerful stimulation of the parasympathetic system occurs after the administration of acetylcholine, which in humans often is administered in the form of a more stable substance, acetyl-beta-methyl-choline hydrochloride. It otherwise would be rapidly destroyed in the blood stream by the choline esterase. This destruction can be slowed or prevented by the administration of physostigmine. The effects of acetylcholine are a powerful stimulation of sweat, salivary and tear glands, also of the glands of the bronchial tubes and of the gastro-intestinal tract. There is marked dilation of the blood vessels of the trunk and face and marked increase in motor activity of the intestines. There is also a fall in blood pressure and a constriction of the bronchial tubes.

Atropine inhibits all the effects of acetylcholine and, curiously enough, also paralyses the sweat glands. This became understandable when Dale and Feldberg (1943) demonstrated that the parasympathetic fibers to the sweat glands respond to cholinergic stimulation.

That nerve impulses themselves might be mediated in a chemical fashion was first suggested by Elliott (1935). Otto Loewi (1921) showed that fluid used to perfuse the heart of a frog during stimulation of the vagus nerve contained a substance which slowed the heart of a second frog. The same sort of substance then was shown to occur in the salivary glands after stimulation of the chorda tympani nerve and at the ganglionic synapses (Feldberg and Gaddum, 1934), even including the endings of the

splanchnic fibers which supply the adrenalin-secreting cells in the adrenal medulla. At the end of postganglionic fibers Cannon discovered the production of the adrenergic substance sympathin, mentioned above. The unique function of these chemical substances, in addition to the mediation of nerve impulses, seems to be to distribute autonomic impulses through direct stimulation of smooth muscles, only one per cent of which have separate nerve endings (Stoehr, 1928). It seems that the locally produced sympathin, the circulating sympathin, and the circulating adrenalin all work together to unify and synchronize the operation of the sympathetic system. It now appears probable that quite generally a chemical step intervenes between the electric impulse which is transmitted through a nerve fiber to its ending and the effector mechanism in muscles and glands. In the sympathetic system and in the nerves supplying the skeleto-musculature the reaction is mediated by an acetylcholine-like substance which is destroyed within a minute fraction of a second and produces only a very localized response. Sympathin and adrenalin show a more widespread and sustained effect.

An important observation is the *sensitization* phenomenon. Even after an organ has been deprived of its sympathetic fibers it will still be stimulated by these circulating substances. Curiously enough, when an organ is deprived of its sympathetic nerve supply, its sensitiveness to circulating adrenergic substances is greatly increased. As a result, the injection of adrenalin produces an increased constriction of peripheral blood vessels after the destruction of the autonomic nerve supply. The sensitization phenomenon seems to account for the fact that there is no chronic flaccid paralysis of smooth muscles after denervation. There is little functional impairment because the muscles respond vigorously to the circulating substance in the blood. Cannon (1938) has formulated this as follows: "When in a series of efferent neurons one unit is destroyed an increasing irritability to chemical agents develops in the isolated structures. The effect is maximal in the part denervated." This phenomenon has become of major importance in surgical efforts to relieve spastic conditions in the arteries of the extremities (Reynaud's disease) by removal of the sympathetic nerve supply. Early operations failed because after cutting the postganglionic fibers

the arteries, being sensitized, became more spastic than before. This sensitization does not occur after interruption of pre-ganglionic fibers. Surgical interruption of these fibers, therefore, relieved the spasticity.

The *hypothalamus*, situated in the diencephalon at the floor of the third ventricle just above the optic chiasm and the sella turcica (the latter containing the hypophysis), is the principal center for integration of visceral functions controlled by the autonomic nervous system. The constituent cell masses may be divided into four groups, an anterior portion, a middle portion, a lateral area, and the posterior. They have elaborate connections, both afferent and efferent, with the thalamus and with the cerebral cortex. Stimulation in the laboratory of the anterior and medial portions can be shown to produce sweating, contraction of the bladder, inhibition of the heart, and increased motor activity of the stomach and the intestines, largely a parasympathetic picture. Stimulation of the posterior and lateral nuclei, on the contrary, gives a picture of sympathetic stimulation, producing acceleration of the heart rate, elevation of blood pressure, inhibition of the intestines, and dilation of the pupils. While this topical relationship to the major divisions of the peripheral autonomic system is important, the most significant regulatory functions have to do with the maintenance of proper metabolic functions. Destructive lesions in the laboratory or by disease (brain tumors) indicate that cell destruction in the posterior part will be followed by a fall in basal metabolic rate, heart rate, and temperature. There is also a general state of lethargy and sleepiness. Destruction in the middle portion may be followed by high blood sugar, violent gastrointestinal activity, ulcerations of the intestines, and disturbed heat regulation. Destruction in the frontal aspect causes a marked disturbance in water metabolism (diabetes insipidus). It is followed by degeneration of the hypothalamic parasympathetic outflow and degeneration of the posterior lobe of the pituitary gland.

On the level of behavior, any of these syndromes are likely to be accompanied by changes in personality, varying from depressed to excited states. In animals Fulton and Ingraham (1929) found that lesions of the anterior hypothalamus tend to produce excited states while posterior lesions are likely to be accompanied

by lethargy, indifference, depression, and a tendency toward catatonia (Harrison, 1940).

The hypothalamus is also an important integrating center of emotional responses. Perception, memory, or anticipation of disturbing situations or perturbing individuals find access here to effector systems involving skeleto-muscular activity—fight, flight, pursuit, sexual activity or expressions of grief. Disturbances in the appropriate execution or untimely occurrence of these response patterns are the chief interest of psychiatry in autonomic neurology.

In anxiety neurosis the visceral part of emotional expression occurs, often without reference to any specific disturbing situation, is not recognized as emotion by the patient, and is considered as illness in a specific organ; for instance, heart acceleration to the patient heralds heart disease. Autonomic neurology makes the psychiatrist seek for evidence of other disturbed visceral functions. He will identify the patient as a "multiple complainer" who, in addition to heart disturbance, shows other evidence of autonomic imbalance. Attacks of such imbalance may occur in rather pure syndromes, either of an cholinergic or of an adrenergic type; there may be a combination of dry mouth, pupillary dilation, heightened blood pressure, accelerated heart beat, pallor, and intestinal sluggishness, or there may be a combination of flushed face, hot flashes, lowered blood pressure with lightheadedness, increased intestinal activity, sweating, and salivation. In the majority of instances, however, one finds evidence of mixed autonomic disturbance. Both the adrenergic and cholinergic types of anxiety attacks may be reproduced by injections of the appropriate substances (Lindemann and Finesinger). The clinical work may be directed either toward reducing the irritability of the autonomic nervous system by sedation, or toward shifting the balance of the autonomic nervous system by the administration of appropriate sympathicomimetic or parasympathicomimetic substances, or one may try to produce adequate expression of the whole emotional response pattern involved by recalling with the patient the original situation which set up the abnormal emotional response (psychotherapy).

Regional autonomic disturbances comprise the clinical syndromes which are grouped together as psychosomatic disorders. Migraine, due to spasms of cranial arteries, may be re-

lieved by ergotoxin; bronchial asthma, due to spasm of the bronchial tubes sensitized to parasympathetic stimulation, may be alleviated by adrenalin; spasms of the arteries in the extremities may be alleviated by removing their sympathetic supply; chronic high blood pressure (essential hypertension) has been successfully treated by removing the sympathetic supply of the large arteries. Gastric ulcer, spastic and ulcerative colitis have usually required a careful review of sources of emotional disturbance in addition to medical or surgical management. Advances have recently been made, however, in controlling autonomic stimulation of the involved organs. Interruption of the parasympathetic supply of the stomach has been tried to prevent further ulceration in the presence of peptic ulcer.

Autonomic neurology is, then, the study of the integration of visceral functions, the maintenance of homeostasis, and the adjustment of the organism to disturbances of emotional reactions.

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ASPECTS OF BLINDNESS, PSYCHOLOGICAL.—The term "blindness" in common usage includes not only total absence of vision but all degrees of visual defect so severe as to prevent one from carrying on the ordinary activities of life for which sight is essential. The following definition of blindness in ophthalmological terms is the one most widely accepted: "Central visual acuity of 20/200 or less in the better eye with correcting glasses; or central visual acuity of more than 20/200 if there is a field defect in which the peripheral field has contracted to such an extent that the widest diameter of visual field subtends an angular distance no greater than 20 degrees." In Warren's *Dictionary of Psychology* blindness is defined as "A generic term denoting inability to see, whether the cause of the abnormality be peripheral, central, or intermediate."

Neither of these definitions takes into consideration the factor of age at onset of blindness, which is of great importance from a psychological point of view, since a person who becomes blind later in life is able to make use of his visual memory. It is generally agreed that blindness occurring before five years of age deprives the individual gradually of useful

visual memory, although no experimental study has been conducted to support this assumption.

Any discussion of the psychological effects of blindness must take into consideration (a) degree of sight and (b) age at onset of blindness. The full extent of the restrictions resulting from the visual handicap may be felt only by individuals who have been totally blind from birth or who became blind at such an early age that they have no workable visual imagery. The amount of sight and the age at onset of blindness, however, are not the only factors that cause differences in the extent to which the handicap affects the individual. Intelligence, environment, education, and, probably, inclination to certain psychological types of imagery and learning are some of the other factors which determine the usefulness of vision in each individual case.

Blindness restricts the individual in three basic ways:

(1) *Restriction in the range and variety of concepts.* Totally blind individuals must build up their conception of the world by the use of the remaining senses. In doing this they must rely almost exclusively upon tactual and auditory perceptions and kinesthetic experiences. Although hearing gives certain clues in regard to distance and direction it does not convey any concrete idea of objects as such. Perception of space (space broadly interpreted as including everything extending into three dimensions involving form, size, position, distance, and direction) can be achieved by touch, in which kinesthetic sensations play a more or less important role. Tactual perception, however, has distinct limitations because of its inherent necessity for direct contact with the object to be observed. Certain objects are inaccessible for direct contact, as for instance the sun, or clouds; other objects are so large that they cannot be tactually observed in toto, as mountains or lakes; others are so small, tender, or fragile that they cannot be touched, e.g., some animals or flowers. Objects in motion, live objects, and objects under certain conditions, such as burning or cooking, do not lend themselves to observation by touch partly because they change their shapes and positions and partly because of the danger involved in direct contact. It must also be recognized that the sense of sight permits much more perceptual activity than the sense of touch be-

cause the eyes are almost constantly open to stimulation from the outer world while touch needs to be actively applied for the purpose of securing impressions.

Unlike space perception, color perception, which results from stimulation of the retina, is solely a visual function. Therefore, totally blind persons cannot perceive color at all, although they acquire substitutive ideas for colors through sensory, verbal, or emotional associations. The idea of the color *blue*, for example, might be determined by the association "blue sky." Thus all or some of the different sensations and emotions caused by fine weather may build up substitutive ideas of the color *blue*. These ideas not only have value subjectively as components of the blind individual's world of imagery but also enable him to communicate with the seeing in common terms, though not on the basis of common experiences.

These limitations in the perceptual field cannot but result in a restriction in the range and variety of the ideas and concepts of blind individuals.

(2) *Restriction in the ability to get about.* This restriction implies a twofold handicap in that it limits the blind person in his locomotion and also makes him dependent upon the assistance of others, thus affecting his social relationships and attitudes in varying ways and degrees. A blind person cannot get about by himself nearly so much as a seeing person can in order to change his surroundings and secure opportunities for observation and activity. Therefore, besides being limited in the perceptual field, blind individuals from infancy on are exposed to a reduced number and variety of experiences. The restriction in the ability to get about must be recognized as exerting great influence on the over-all development of the blind child. He needs to be supplied with experiences and opportunities for activity which most other children meet in the ordinary course of their development.

When the individual grows out of the comparatively sheltered life of the home or the institution and is confronted with the task of social and economic adjustment to the world of the seeing this restriction carries new implications. In the extreme case, the blind individual not only may take help in getting about for granted but may expect to be helped along all

lines. He has fallen back to a level of protection which is characteristic of infancy and will develop beyond it only if his self-confidence is built up and if he accepts his handicap in its real proportions. On the other hand, a blind person may resent and even revolt against being aided in many of the activities which he knows seeing persons can pursue independently of others. Either of these attitudes—if it persists as a disturbing influence—indicates a lack of adjustment and has its deeper cause in the non-acceptance of the handicap. Although the reactions of the majority of blind individuals do not follow these extreme patterns, restrictions in the ability to get about are unquestionably cause for feelings of deprivation and frustration.

(3) *Restriction in the control of the environment.* Among the human senses sight is the one sense which overcomes distance and gives at the same time details and relationships of form, size, and position. This "object quality" of visual experiences permits a contact with and a control of the environment far greater than that achieved by all the other senses. Lack of sight causes detachment from the physical, and to a less degree from the social, world. A blind person, for instance, cannot become informed about his situation within the environment by any rapid process as seeing persons can by just glancing around. The clues which he might get through hearing and through touch observations within his reach give him only very little that could assist him in controlling his environment and himself in relation to it. This detachment affects the blind individual in different ways during his development. The blind infant, for instance, does not reach out or crawl towards objects, as a seeing child does, because nothing entices him to do so, unless he is made aware of these objects by other sensory impressions. Actions of daily life, such as eating a meal, which are simple for the seeing, assume different proportions when they are not controlled by sight. Also, the blind individual from infancy on cannot acquire behavior patterns on the basis of visual imitation. In social situations he cannot become informed about the required behavior as seeing people can simply by watching others. This makes conforming with the group from childhood on a much more difficult task. The isolating effect of

this detachment restricts the blind individual in his control of the environment and results in increased feelings of insecurity and in a state of higher nervous tension.

The question as to how the three basic restrictions discussed affect the lives of blind individuals can at the present be answered only in a rather general way because we are lacking in scientific studies which would enable us to make any statements on the basis of actual case research. It can be said, however, that the basic limitations radiate into the personal, social, and economic spheres of the individual's life and, since these spheres vary in depth, extension, and development from individual to individual, the limitations caused by blindness have a different effect in each case.

In dealing with the effects of blindness on the perceptual level we must recognize that the experiences of the blind, although different from those of the seeing, have the same subjective value for them and contribute to just as complete and satisfactory an individual conception of the world as that of other persons.

The perceptual restrictions, however, give rise to verbalism and may cause certain behavior forms known as "blindisms." Verbalism is caused by the comparative paucity of first-hand experiences which frequently forces blind children to use mere words without an understanding of their real meaning. A certain amount of verbalism is unavoidable and socially necessary but educational methods should be directed towards concrete experiences in order to give real meaning to as many words as possible. Blindisms are a result of lack of stimulation from the external world which furthers the child's concentration on the self and encourages the exercise of self-stimulation. Blind children resort to such activities as shaking the head rapidly, or swaying the body back and forth. These blindisms usually disappear in the course of a child's development if sufficient stimulation is provided.

The effects of blindness also tend to drive the blind individual into a world of unreality and phantasy in which he may find compensation for his real or supposed failures. This may be the case particularly when the individual meets with difficulties in his social adjustment, such as rejection by parents, playmates, or a prospective employer.

Psychological problems of blindness received consideration in the early period of scientific psychology. William James as well as Wilhelm Wundt discuss in their standard works the problem of spatial perception by the blind. The first systematic study dealing with psychological problems of blindness as such dates back to the experimental laboratory of Wundt where Theodor Heller conducted investigations which he reported in his *Studien zur Blindenpsychologie* (1895). Since then, psychological research in the field of the blind has dealt mainly with problems of sensory experiences of the blind as compared with those of the seeing, with the ability to perceive obstacles, and with the measurement of intelligence. Only recently—and mainly as an outcome of social-work efforts—has the study of personality problems of the blind received attention.

Numerous discrimination experiments have been carried out with blind subjects proving that in general they have no greater sensory acuity than other individuals. These experiments tested discrimination of pressures and of weights, sensitivity to temperature changes, ability to localize sounds, etc. The superior achievement in the practical use of the remaining senses that blind persons may show is the result of attention and increased use. Experiments on the memory of blind children—rote memory, recall, and logical memory—also do not reveal any superiority in the blind. All these investigations have contributed to disprove any assumption of innate or automatic "sensory compensation."

There are two problems in the field of sensory perception of the blind which have been widely investigated: the tactual perception of space and the ability to perceive obstacles. Theories disputing the possibility of acquiring a conception of space by touch have been set forth as well as theories analyzing the different ways in which blind individuals acquire tactual knowledge of space and of spatial qualities of objects. There is now a general consensus of opinion that the tactual space of the blind is different from the visual space of the seeing. Two types of tactual perception by the hands have been differentiated for the purpose of psychological analysis. Enveloping touch, by which small objects are enfolded with one hand or with both hands, is called "synthetic" because

the object is perceived as a whole simultaneously. The second type of tactual perception is applied to larger objects which extend beyond the limited embrace of one or both of the hands. In this the moving hands follow the shape of the object and, if it is large, the arms and the whole body may actively participate. This kind of touch perception is called "analytic" because it gives successive impressions of parts of the objects. The question of how these successive perceptions lead to a unified idea of the object as a whole has not yet been conclusively answered. Mental processes of tactual space contraction and tactual space expansion and the formation of spatial "Gestalten" are given as explanations by various theories. The importance of sensations of movement in the tactual perception of space is stressed by all investigators of this problem.

In the task of orienting himself and finding his way in familiar or in unfamiliar surroundings the blind person makes use of practically all his senses: his sense of hearing is constantly active in observing all kinds of sounds, including echoes; he interprets odors which come from many sources; he notices changes of temperature and air currents; his feet feel the nature of the ground; he observes distances in terms of time, through movement, and through sound—in fact any clue that he can obtain is interpreted for the purpose of orientation.

The perception and avoidance of obstacles by the blind is a long-standing topic of speculation and research. Some investigators have explained this "obstacle sense" as depending upon auditory, temperature, or pressure sensations, or upon a combination of these, usually with the supposition that increased sensitivity in one or more of these sensory fields is a basic factor. Others have suggested much more complicated explanations. It was found that not all blind persons possess the ability to perceive obstacles and that many sighted persons either have it or may acquire it by practice. Auditory stimulation has been claimed most consistently as being necessary for the perception of obstacles. The results of the latest investigations refute the pressure theory, insofar as it applies to the face and other exposed areas of the skin, and prove that aural stimulation (either heard or felt) is both a necessary and a sufficient condition for the perception of obstacles. Sound waves of

higher frequencies are assumed to play an important role in it.

The use of intelligence tests with blind children has received considerable attention. The first adaptation for the blind of the Binet-Simon Scale was made by Robert B. Irwin and H. H. Goddard, in 1914. Since then, Samuel P. Hayes has developed several adaptations of the Binet-Simon test, particularly the Hayes-Binet scale of 1930 based on Terman's Stanford Revision and the Interim Hayes-Binet Intelligence Tests for the Blind, 1942, based on the 1937 Terman-Merrill Revision. The verbal series of the Wechsler-Bellevue Intelligence Tests, with the vocabulary test substituted for the digits test, is also used in testing the blind. Of the group intelligence tests, the Kuhlmann-Anderson tests have been adapted for use with blind pupils.

According to Hayes the percentage of blind pupils in the average and superior intelligence brackets is smaller than that of the general school population in these brackets and the percentage of dull, border-line, and feeble-minded is much larger. There are no studies available on the intelligence of blind preschool children or blind adults. It must be understood that the instruments used for measuring the intelligence of blind children are those devised for seeing children and adapted for the blind by omitting certain items that cannot be used with the blind and by substituting others.

The use of achievement tests with blind pupils reveals that although blind children begin their schoolwork more or less on a par with the seeing they fall increasingly behind as they progress from grade to grade. Since schools for the blind follow the grade standards generally accepted in public schools the retardation of blind children manifests itself in an increasing overage of the pupils. Besides blindness as such—which affects particularly the information component of the tests—heredity, poor environment, illness, emotional conflicts, and late admission to school are some of the factors which contribute to the unfavorable distribution of IQ's and to the educational retardation.

Another contributing factor is the slowness of braille reading, which limits blind children in the amount of material they can read. This

is of particular disadvantage since blind children must rely upon reading as a source of knowledge to a much greater extent than do seeing children. Braille is the most important reading medium for the blind. It is a touch system in which the letters of the alphabet are represented by various combinations of embossed dots in cells two dots wide by three dots high. Although contracted systems of braille are used, braille reading is slow as compared with visual reading, oral or silent. Blind children read in braille only one-third or one-fourth as fast as other children do in silent visual reading. (In general three times as much time is allowed for the completion of tests involving braille reading.)

Experimental work in the psychology of touch reading was done mainly by Karl Bürklen prior to 1917. It showed that the legibility of braille characters does not depend upon the number of dots but upon their configuration; that reading is fastest when both hands are used; that the index fingers seem superior to the others; that good readers employ touch movements in a straight running line with slight and uniform pressure, while poor readers employ irregular touch movements and exert heavier and more irregular pressure; that there is very little decrease in touch sensitivity even after long reading; and that braille reading cannot be considered as especially fatiguing. Further research on braille reading which would take into consideration the present findings in the field of visual reading is greatly needed.

The study of personality characteristics of the blind is only in its beginning. In the available literature it is stressed that the handicap does not affect all personalities in the same way; that the reactions of the social environment to the handicapped person are of basic importance and that it is not so much the handicap as the social treatment which causes emotional conflicts and feelings of inferiority and insecurity in the blind individual. Blind adolescents were found to be below the norms for the seeing in respect to personal and social adjustment.

Many blind persons have written about their own experiences; some of them very subjectively but some with considerable candor and objectivity. Two extreme attitudes toward blind-

ness are represented in these writings. The loss of sight is regarded on the one hand as nothing but "the loss of a convenience" and on the other as a handicap that "changes and utterly reorganizes the mental life of the individual." These personal documents—indicative as they may be—must largely be classified as "literature of opinion." Scientific studies of the personal and social effects of blindness are needed to make up a body of "literature of fact" in this field.

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CHILD PSYCHOLOGY.—In so far as the sensations, feelings, and behavioral capacities of children overlap those of adults, child psychology parallels general psychology, with the same divisions of subject matter. Nevertheless, a distinctive approach becomes possible from the fact that childhood is the period of rapid growth and development. Hence, child psychology may be conceived as the science of mental and behavioral development and of the factors which affect it and modify it. The great value of child psychology lies in its potential application to education, child welfare, and preventive mental hygiene. Accumulation and verification of knowledge must, however, precede its application. In the past, zeal for quick results often led to hasty generalization. Rules for child training were often laid down dogmatically and copied from one manual to another, with no attempt to observe objectively the results of applying the rule or the results of omitting its application. Careful observation and experimental controls were taken for granted in adult psychology at a time when child psychology was still in the stage of authoritarian dogma. During the past fifty years, however, methods of child study have become increasingly precise, and a reliable body of information is accumulating.

Methods. The earliest attempts to present facts in child psychology were biographical records of the authors' own children. The kindergarten movement provided large groups in which several children could be observed under identical conditions, and many of the most interesting studies have been made in connection with kindergartens and nursery schools.

The parent with a pride in his child, the teacher eager to prove her own methods successful, and the philosopher seeking support for his theory are all open to the suspicion of prejudice in their observations. The safeguard of objectivity is to have several disinterested observers; but to have the children surrounded

by a gallery of observers would immediately alter the situation. Children behave quite differently if they are conscious of an audience. The Yale Clinic of Child Development has solved the problem by two simple devices: (1) the one-way screen behind which a score of observers may watch the spontaneous behavior of children who do not know that they are being watched; and (2) the motion-picture camera to record the activity of children who do not know that they are being photographed. On the motion-picture screen it is possible to flash in rapid succession the records of the same child taken months or even years apart. With such data, it is possible to show how the same child's response to the same stimulus alters as his growth progresses. Thousands of questions about the genesis and the control of behavior will probably be answered by extensions of this method.

Unfortunately, the thoughts, feelings, and motives of children must still remain matters of conjecture as we watch their performance on the screen. This fact is explicitly recognized by the psychologists who employ these objective records. Meanwhile, other psychologists have sought other methods for investigating the thoughts, feelings, and motives of children.

Many data on the inner life of children have been collected by the questionnaire method, first introduced by the Berlin Pedagogical Society in 1869 and subsequently popularized in America by Granville Stanley Hall. The method is open to at least two sources of error: (1) different children may interpret the same question diversely; and (2) some questions may be answered untruthfully, especially if the true answer be incompatible with self-esteem or with the child's notions of what the adult questioner expects.

An indirect approach to the study of emotions and motivation is made possible by the so-called projective techniques. In these indirect approaches, the child unwittingly reveals many hidden personality factors while ostensibly let-

ting his imagination play with the test materials (toys, ink-blots, pictures, unfinished stories, and the like). These techniques, however, have been criticized on the ground that they are not sufficiently objective, and that the actual data supplied by the child are very meager compared with the interpretations read into them by enthusiasts for these methods.

Clinical data, also, though often they are the only evidence we have for questions of great import, fall short of the objectivity and the reliability that must remain our ideal as scientists. The child is usually brought into the clinic because of some behavior problem. He is sensitive, emotionally wrought up, and fearful of revealing anything that may count against him. Likewise, parents and other persons who have had any responsibility for his training are usually on their guard lest they reveal anything that may reflect upon their own adequacy. In some states, clinical data are collected and subjected to statistical analysis on a state-wide basis. A report of this type is a valuable contribution to science, provided that these data are recognized for what they are—namely, summaries of statements collected from individuals of various degrees of veracity, many of them having been made under embarrassing circumstances. We need to remember that no amount of statistical manipulation of data can introduce any more truth into the data than there was to begin with.

Furthermore, a clinician's skepticism as to the client's veracity does not increase the reliability of the data. In fact, the reverse is true. The moment he begins the work of editing his client's statements—attributing this one to "wishful thinking," that one to "rationalization," and so on—his own preconceived theories have crept into the situation. Thus, the case history is no longer a history but a historical novel, with the interpreting clinician as the novelist.

Mental testing and other so-called measurement procedures yield more reliable data than the questionnaire and the clinical interview. The early testers emphasized cross-sectional studies of large numbers of children at specified age levels. Recent emphasis has been upon longitudinal studies, in which the same children are tested and observed at regular intervals over a period of years.

Repeated tests give psychologists and edu-

cators an effective tool for measuring the results of any educative procedure, provided that matched groups are used to rule out the effects of extraneous factors. The control group should be initially equal to the experimental group and exposed to all the same environmental influences except the one being tested. Ideally, each member of the experimental group is matched with a member of the control group in chronological age, mental age, physical development, socio-economic status, and every other factor that can be conceived to have any possible bearing upon the problem.

It is, of course, easier to postulate such equality as a desideratum than to attain it in actuality. No matter how many specific measurements we may make, some factor is likely to be overlooked, and any differences that we find between the experimental group and the control group at the end of the experiment may be due to this forgotten factor. The hardest factor to equate is that of heredity. No two children, not even siblings, can be assumed to have the same heredity except identical twins. Hence, the ideal control group is that which is composed of the identical twins of the experimental group. Gesell, McGraw, and others have used the method of co-twin control in some of their most important experiments. Newmann, by collecting histories of pairs of identical twins separated in early childhood, has learned much about the relative importance of heredity and environment. He has found that heredity contributes the most to physical development and the least to character, with intelligence occupying a middle position.

All the earlier studies focused attention upon the child's behavior or his putative emotions. Situational analysis has been emphasized in some recent studies; and there have been observational studies of mothers, teachers, and even dentists, as social stimulators of the child. It has been found that domineering behavior often arouses rebellion; so does protective behavior that thwarts the child's growing desire for independence. Parallel check lists enable the observers to record the child's exact response to a particular item of adult behavior before it is forgotten or overlooked in the welter of subsequent incidents.

Important results of childhood conditioning may not appear until later life. Longitudinal

studies are complicated by the fact that the children are exposed to a multitude of conditioning factors beyond the control of the investigator. For this reason, animal experimentation is sometimes used to provide an experimental check upon theories not otherwise accessible to experimentation. Though results upon animals should not be accepted uncritically as applying to human beings, they do often provide a valuable supplement to other data, especially when the animal experiment was designed to test a theory originally growing out of clinical experience with human beings.

Explanatory Principles. Laymen and beginning students desire simple explanations. They want to be told briefly and at once the cause of stuttering, or of reading disability, or of delinquency. Now, actually each of these conditions is very complex. Each may result from a number of causes operating successively or simultaneously. Insistence upon a single cause for every phenomenon is responsible for many fruitless controversies: for example, the controversy over heredity versus environment. Actually, both heredity and environment contribute to every act that the child performs. At any given moment the individual is the product of all his heredity plus every environmental influence that has played upon him during his entire previous life.

Modern psychology views the child as a unitary psycho-biological organism, responding to environmental stimuli in so far as these appear relevant to his needs and continually modifying his behavior as maturation and learning proceed.

Learning is the acquisition of behavior patterns, ideas, and attitudes as a result of experience. It is contrasted with maturation, which is the development, both structural and behavioral, resulting from the growth of the organism. Thus, maturation includes all those changes that result from the hereditary potentialities. Learning includes all those behavioral changes (desirable and undesirable) that result directly from adaptations to environmental stimulation. It excludes those changes in behavior which result indirectly from alterations in body metabolism due to malnutrition, limited water intake, bad air, and the like, except in so far as these conditions stimulate the organism itself to active behavior.

Much future research should be devoted to the neural and the behavioral effects of biochemical conditions resulting from such conditions as faulty nutrition, polluted air, and so on. Though the facts are yet to be ascertained, it is entirely possible that these conditions may be partly responsible for the fact that underprivileged children are, on the average, less efficient scholastically than the children of the privileged.

Nevertheless, the child is, almost from the start, a social organism as well as a biological one. His needs include love, acceptance, and approval. Even at the age of eight weeks, infants notice people more than things; and by the time a child is forty weeks of age, he seems to make a definite effort to please and also to imitate. From then on, throughout the preschool period, he becomes increasingly responsive to suggestions, unless these suggestions run strongly counter to his biological needs, his present sets, or his previous learnings. This generalization is not contradicted by the fact that many children go through a period of negativism around the age of two or three years. To the neutral observer, this negativism is just as much a response to suggestion as any of the child's other responses. The socially suggestible child imitates a bad example as readily as a good one. The stimulus to negativism on the child's part is domineering activity on the part of an adult. H. H. Anderson has shown that domination by the adult leads either to apathy or to rebellion on the child's part, whereas *integrative behavior* leads to cooperation and desirable learnings. It is upon this social responsiveness of the child that practically all education and training depend.

Educational Premises. The imparting of knowledge and skills is only part of the educator's task. The child's emotional attitudes toward himself and his social group are even more important. We cannot educate his "mind" without at the same time affecting every other aspect of his personality. It is therefore advisable to have in mind not only specific goals in subject matter but also the broad goal of education as a whole. What sort of person do we want this child to become? Do our present educational impacts help or hinder the acquisition of this desired personality?

Every educational program must be based

upon some idea of the original nature of the child, his present status, the goal to be sought in educating him, the degree to which this goal is attainable, the extent to which its ultimate attainment must depend upon natural growth on the one hand and educational intervention on the other, and finally the safest, most efficient, and most economical means of reaching the goal.

The goal of the modern educator is the poised, self-confident, healthy, happy, socially contributing adult. It is now recognized that this type of adult is most likely to result if poise, self-confidence, health, happiness, and social contributions are made possible throughout childhood. Self-confidence is built upon experiences of success. Health is safeguarded by providing adequate and sufficiently varied food, opportunities for restful, undisturbed sleep, constructive guidance in health habits, and above all, protection from injury, infection, and especially from the disturbing emotional experiences which are now known to cause a high percentage of health problems. Happiness is a by-product of health, satisfied needs, unimpeded growth, successful efforts, and harmonious social relationships. Poise is the absence of emotional outbursts and the ability to remain calm even under trying conditions. It develops gradually as the individual learns to cope successfully with the problems that confront him.

Social contributions become increasingly *possible* as the child gains in knowledge and skill. Whether he *wish* to make such contributions depends largely upon his previous experiences. The preschool child is usually eager to help. When older children dislike work, this is the result of adverse conditionings. In some cases, the child has been ridiculed for mistakes or scolded for accidents. In others, he has been led to expect rewards that were not forthcoming. In other instances, work has been assigned as a punishment, and hence attitudes toward punishment have been extended to work by association. In still other instances, the program of work assigned to the child has been so excessive or so ill-timed as to interfere with normal play interests or to create a humiliating contrast between this child and his associates. On the other hand, if a child's earliest efforts to help out with the necessary work of the household are rewarded with success, appreci-

ation, and appropriate recognition, the habit of contributing actively to the general welfare can be built up as naturally and easily as any of the simple health routines.

The greatest barrier to health and happiness in childhood and to the development of a poised, self-confident, socially contributing personality is the persistence of educational practices which were logical outgrowths of mistaken ideas of child nature formulated before the scientific study of children was begun. The old ideas have long since been abandoned, but practices built upon them are continued with stubborn atavistic persistence.

Throughout the eighteenth and much of the nineteenth century, ideas about children were colored by theological dogmas. The child was thought to inherit an almost demoniacal will along with his original sin. Theologians believed it the first duty of the educator to break the child's will. Modern psychologists recognize no such will. They regard the activities, impulses, and desires of children as natural outcomes of their biological needs and social conditionings. Hence, the problem of the modern educator is to satisfy bodily needs and regulate social conditionings in such a way that desirable behavior results.

Because theologians of earlier centuries believed the child's own impulses were inherently evil and that the parent through long moral training had learned what was best, it was logical that they should insist on absolute obedience. The steady advance of research, however, has shown the extent of our past ignorance. This ought to make us humble and a little skeptical about our dogmatic certainties concerning what is best for the child. But without adult omniscience, the logical excuse for arbitrary authoritarianism is gone. Since neither party knows the whole truth about anything, it is more reasonable for children and adults to grow up together, each respecting the feelings of the other, each making concessions, neither imposing his own will all the time.

As we have said, the first educational goal of the eighteenth and nineteenth centuries was perfect obedience, blind submissiveness to authority as embodied in parent or teacher. Strangely enough, many of the most intelligent men trained under this regime became the rebels and revolutionaries of their time. Mod-

ern psychology offers a simple explanation for this seeming paradox. Overemphasis upon obedience inevitably leads to conflict between parent and child with much frustration (q.v.) for both. The frustrated parent commonly punishes the child, thereby increasing the child's frustration. The child usually enjoys some revenge in the form of stubbornness and misbehavior, but fear prevents him from fully working off the aggressive impulses aroused. They tend to crystallize into repressed hatred. His problem is complicated by the fact that he also loves his parents. He cannot bear to acknowledge the hatred even to himself. It remains an unconscious (or at least un verbalized) attitude, ready to be transferred to any other authorities who try to control him. When he comes to school, he is set to rebel against the teacher and the principal. A little later in life, it is the police who symbolize the hated authority. There is much clinical evidence to show that delinquents come more often from harsh homes than from indulgent ones.

John Dewey and his colleagues of Columbia were among the first to stress the importance of education for democracy by giving the schoolchild early opportunities for democratic participation. Lewin, Lippitt, and others have made observational studies of the functioning of autocratic, democratic, and laissez-faire regimes in boys' clubs, and found the democratic to be the most desirable from every standpoint. Certain cautions need to be observed in introducing democracy to children accustomed to an authoritarian regime. First, the new powers should be introduced gradually. It is best for children to have much experience in making choices for *themselves* before they attempt to legislate for a group. Otherwise their first attempts at democratic government may take the form of passing arbitrary rules (such as those formerly laid down by their elders) and prescribing penalties for the breaking of these rules. Children with sadistic tendencies, and this includes nearly all children who have been repressed or punished very much, sometimes work off their sadistic impulses with social approval under the guise of punishing violations of rules passed by a juvenile democracy. True democracy is a matter of spirit rather than organization. G. Lewin and K. Lewin contend that democratic education cannot start with an

autocratic treatment of the baby and then shift slowly to democratic methods. It should create a democratic atmosphere for and within the actual world of the child.

"Training" versus "Guidance." Older psychologists conceived of the behavioral learning of children largely in terms of "habit formation." Habits were supposed to be definite responses to definite stimuli, becoming increasingly automatic and invariable as a higher degree of learning was achieved. Gesell and his co-workers have shown that this conception of habit is not adequate to the fluctuating behavior patterns of infancy and early childhood. The main stimulus to early activity seems to come from within. The child exercises the neuromuscular mechanisms that are developing within him. Any convenient object in the environment is appropriated for this purpose. At one period, the baby mouths anything he can get his hands on. Somewhat later he will pound with anything. The same wooden block at different periods in the child's life may become (1) something to grasp, (2) something to mouth, (3) something to pound with, (4) something to drop, (5) something to pile up, (6) something to throw, (7) something to build with, and even (8) something to personify, if no doll is available at the moment. Even in the same developmental period, the same stimulus object will elicit quite different responses, depending on the state of the organism. To a hungry boy, an apple is something to eat; but to the same boy after a big dinner, an apple is something to throw. From infancy to old age, behavior seems to depend more on the state of the organism and its consequent needs than upon the exact physical nature of the external stimulus.

Until quite recently it was supposed that the educator ought to decide upon a definite set of habits in conformity with conventions and start inculcating these in the child as early as possible. Each lapse from the prescribed habit was supposed to weaken the habit and make subsequent lapses more likely to occur. Hence, spontaneous, exploratory behavior on the part of the child was regarded as dangerous. Only slowly have psychologists outgrown this point of view.

If social customs were everywhere the same and unalterable, there might be some economy

in a rigid and invariable set of habits; but in a world where folkways differ from place to place and from one social group to another in the same place, and where progress is constantly introducing innovations, rigid, unalterable habits are detrimental to the individual. We should encourage exploratory behavior, and inculcate routines only to the extent that they seem to provide security for the child and peace for the family.

The older concept of "training" presupposed that the trainer should do all the planning, make all the decisions, and push his plans through, by strategy, if not by violence. The modern concept of guidance assumes that the parent will wait patiently for the child's maturing potentialities to reveal themselves, and will then offer as much constructive help as the child seems ready to accept. This does not mean a policy of *laissez-faire*. Children, especially during the preschool period, are very dependent upon adult interest and approval. Where these are lacking, development may be delayed or warped. The child's language, his table manners, his cleanliness, and a multitude of other factors that affect his social acceptance and consequently his happiness, can only be learned under somebody's guidance, usually his mother's. A large part of what is commonly called "manners" consists of specific motor skills, such as the proper handling of cup, spoon, and fork. The toddler is eager to do these things and to do them right. Let him try, even though he spills. Give encouragement for successes. Give simple, intelligible suggestions for improvement. Avoid criticism which humiliates and destroys the incentive to try. Be patient, calm, and casual about accidents. Precision comes through successful practice, leading to self-confidence and ease.

Guidance should be positive and constructive. Instead of waiting till the child does something wrong, and then scolding him, we should direct his attention to desirable forms of behavior. In "Helping Children Learn" (Cornell University Press), Waring and Johnson offer the following suggestions for early guidance practices: notice the first signs of child effort, no matter how small they may be, and make the undertaking achievable, meaningful, and satisfying to the child (1) by physical aid if he needs it, (2) by verbal direction if he does not

yet know what to do, and by specific approval, so that he may know just what behavior is desirable.

Sometimes the most difficult part for the mother is to realize just how much help is needed, and even more important, what kinds of help are *not* needed. The one-year-old just beginning to walk will appreciate an outstretched hand to support him. At a year and a half he will scorn the proffered help when walking on the level but perhaps welcome it on the stairs. At three or four he will probably resent any effort to hold on to him when he walks, except in crossing streets; but when he learns to skate, he will again welcome a supporting hand. Progress is often so rapid that the protecting mother cannot keep up with it. She is bewildered when the help that was eagerly sought a few weeks previously is now scornfully refused. Self-reliance and independence in the new activity must be attained before the learning can be considered complete, and these can be acquired only when the child is given freedom to try it alone.

"Health Habits." Eating, sleeping, and elimination are often designated as "health habits." Basically none of them are habits in the strictest sense of the term. They are fundamental biological activities which the child does not have to learn, and which he cannot unlearn and survive. All that training can accomplish is to enable him to avoid social conflict by limiting these necessary biological activities to socially approved times and places.

Sleeping occupies most of the newborn infant's time. During the first month, 80% of the day is spent in sleep. The baby wakes at frequent intervals from hunger, but when fed falls promptly asleep again. As the alimentary tract grows, more food can be taken at a time, hunger recurs less frequently, unbroken sleep becomes more prolonged, and the total amount of sleep required gradually diminishes. By the end of the first year, the baby spends only half his time in sleep, usually divided between a night's sleep and a morning and afternoon nap. At the age of eighteen, the average youth still spends about 36% of his time in bed.

Nineteenth-century moralists viewed prolonged sleep as a waste of time and exhorted boys to early rising. Today the biological importance of sleep as a period of recuperation is

so generally recognized that many parents go to the opposite extreme of trying to force children and youths to take more sleep than they require. It is a mistake to put pressure on children about their sleep. When this is done, sleep becomes an unpleasant duty to be postponed as long as possible. Relaxation is essential to sleep. A disciplinary conflict over going to bed promotes not relaxation but tension. Usually sleeplessness is just a symptom of tension. An effort should be made to discover and eliminate the cause of the tension rather than to enforce sleep.

The extent to which health depends upon adequate nutrition has been so widely publicized that many mothers become so nervously determined to feed their children that they defeat their own ends.

The battle for obedience, once centering around religious issues, now centers around eating in a definite sequence prescribed portions of spinach, egg, or carrots. A book or two on dietetics is popularly supposed to give the parent enough information to determine just what foods the child needs and just when and in exactly what amounts. As a matter of fact, dietetics is a very complicated field. Even a partial understanding of its problems requires years of training in chemistry, biochemistry, physiology, and other basic sciences. Fortunately all this knowledge is not required in order to feed a child satisfactorily. This task has been accomplished successfully by parents who could neither read nor write. The danger comes when the zealous parent mistakes half-knowledge for omniscience. The mother should by all means get as much scientific information as possible and offer the child whatever foods the dietitians recommend, up to the limit of her budget, but she should avoid undue insistence. C. M. Davis has shown that even newly weaned infants are capable of choosing foods that keep them in an excellent state of nutrition. When children lack appetites, it is usually because food has been forced upon them in such a way as to make it distasteful. Most undernourished children come from one of two groups, (1) the underprivileged for whom only a meager, monotonous, inadequate diet is provided, and (2) children of food-faddists who provide adequate meals but destroy their children's appetites.

Feeding problems most often arise because the child has been frightened or made angry during a meal. Loss of appetite under these circumstances is natural for a person of any age. Food eaten by a person who is emotionally upset is not likely to be properly digested. Therefore, forced feeding of a child is bad for his health. Moreover, it usually prolongs the feeding problem.

Forbidding a child to have anything else to eat until after he has finished a prescribed portion of some particular food practically amounts to forcing him. He may eat it today to escape the pangs of hunger, but the unpleasant experience is likely to create a permanent dislike for that food—an unfortunate bit of learning, if the food is really desirable. Some children are so hounded by anxious mothers that they acquire a distaste for every wholesome item on the family menu.

Loss of appetite may result not only from insistence on the eating of particular foods, but also from overstress upon table manners, or from the abrupt silencing of a happy, enthusiastic child who is eager to talk, or even from excessive efforts to help a child that is striving for independence. If the mother insists upon spoon feeding a child who is old enough to hold his own spoon, he sometimes becomes enraged; but if she lets him feed himself for a while, he may soon tire and want to be fed the rest of his meal. This is not inconsistency. It merely represents a change in the pattern of needs. The need to practice a new activity has been satisfied, but the need for food persists. Young mothers with tact and imagination can let the toddler feed himself while he wants to and take over the job when he tires; but those who are overconscientious about following a prescribed regimen of training procedures lack this adaptability. Mothers of children with feeding problems are often surprised when their children develop excellent appetites at nursery school, away from maternal pressure and solicitude.

Probably no phase of habit training has caused more trouble to mothers and children or paved the way for more serious maladjustments in later life than toilet training. Old manuals for mothers and nurses used to advocate beginning the infant's toilet training as early as possible, and many young mothers actually

developed a rivalry to see whose child could be trained first, sometimes beginning their efforts in the third or fourth week. Even with this early start, less than half attained bladder control by the end of the first year, and only about 80% by the end of the second year. It has recently been shown, however, that the training period can be greatly shortened with happier results all around, if the mother will postpone any training efforts until the child has reached a stage of physiological maturation sufficient to make real voluntary control possible. Gesell, Ilg, Thompson, Amatruda, McGraw, and others have stressed the importance of maturation as a prerequisite for all forms of learning.

The muscles of urination are among the very last to come under voluntary control. This must await the myelination of nerve fibers connecting the reflex centers at the lower end of the spinal cord with the cerebral cortex, an extrauterine embryological development which is ordinarily completed around the end of the first year. By the method of co-twin control, McGraw has shown that training begun at or after this time can be successful within a few weeks, whereas training begun in early infancy is ineffective before this stage of maturation is reached.

It is true that many mothers by observing a baby's natural rhythm and holding him on his pottie just before the anticipated elimination can manage to keep him reasonably clean and dry. This must have been the sort of "control" established in those cases in the White House Conference Material for which control was reported to have been established before the end of the first year. Surely mothers could not have meant that these infants on their own initiative went to the bathroom and managed their own clothing at an age when most infants cannot walk alone. The absence of accidents at this early age reflects the mother's vigilance rather than the child's. It does not necessarily have anything to do with real training.

A mother whose baby is "trained" in the sense of having a predictable biological rhythm to which she herself has learned to conform should be prepared for relapses when the child grows older—because the natural periods of urination will then be separated by somewhat longer intervals of time. Many a toddler when placed on his pottie fails to perform, only to wet himself a few minutes later. It is a mistake

to interpret this as a voluntary refusal. Punishing a child under such circumstances is a cruel injustice and may lead to serious results, reaching even into adult life. Punishment is not always physical. The mother who acts shocked or embarrassed or greatly disappointed in her child is punishing him. In fact to a child that loves his mother (and practically all children do), her emotional reaction is more effective than anything else she does. And what does he learn from her emotional reaction to accidents of this sort? He learns to regard the simple biological processes of defecation and urination as shameful in themselves. Because of shame, some children conceal these needs as long as they can, even to the impairment of health. Some cases of constipation are reported to have originated in this way.

Because of the anatomical proximity of the sex organs to those of elimination, sex prudery and many forms of maladjustment are believed by some clinical psychologists to have their roots in emotional traumata of the preschool period, frequently in connection with toilet training.

Young mothers who have kept their babies clean and dry by their own vigilance sometimes think the preschool child has regressed when he is not able to assume the responsibility for himself.

Actually, the real learning does not begin until the child is able to perceive the sensations of tension in rectum and bladder, interpret their meaning, and signify his need to his mother or some other adult, at first by grunts and gestures, later by words. In this stage of learning, freedom from accidents will depend upon the promptness with which adults understand and grant his request for the help needed. The building of an appropriate vocabulary early in the preschool period is very important. Adult prudery seems to prevent many parents from teaching their children the ordinary English words that could be understood by everybody. Some children who were completely trained at a year and a half, so long as they remained with their mothers, develop "enuresis" when they enter nursery school, kindergarten, or even first grade, because they either do not know how to tell the teacher their needs or are too embarrassed to do so.

Emotion. Emotional learnings inevitably ac-

company learnings of all kinds. The physiological basis of emotion is a part of the hereditary equipment of the species, but differences in emotional expression and in the objects and situations that arouse it apparently depend upon conditioning, chiefly in early childhood.

Desirable emotional development involves not only control over the more undesirable emotions but also the growth of self-confidence, social feeling, and a sense of belonging.

The emotional climate may be more important than any particular thing the mother says or does. Professional psychologists should therefore be careful not to discourage or antagonize young mothers, for in so doing they may increase the mother's anxiety, which is often the main source of the child's problem. Reassurance and encouragement of the mother and praise for her efforts may relax her tension, enabling her to take more joy in her child, and thus to give him the love and acceptance which are his greatest emotional needs.

Different observers have differed considerably in their reports on the apparent emotional life of infants. Watson thought that he observed in the new-born infant three emotions: love, fear, and anger. Bridges found only one: excitement. She reported that distress and delight are not clearly differentiated till about three months. By the end of the first year, several more emotions are distinguishable.

Watson reported that new-born infants have only two fears,—a fear of falling and a fear of loud noises. He accumulated evidence to show that all other fears are acquired in the course of experience. Any stimulus that becomes associated with pain or injury may become an object of fear, but the majority of fears are socially acquired. The young child tends to reflect his mother's emotional attitudes. This contagion of emotion serves to protect the toddler from real dangers while he is still too young to understand the nature of the danger. If the mother cries out in alarm or jerks him back when he starts to cross a busy street, he learns to be afraid of street crossings and wait for adult guidance. Similarly, he learns to shun poisonous snakes and snarling dogs without waiting for the costly experience of being bitten. Fear displayed by parents, siblings, or associates is sufficient warning. Conversely, if parents and asso-

ciates have foolish fears, the child will absorb these with equal ease.

It is a mistake to try to cure a child's foolish fears by ridicule. This simply leads to inferiority feelings and adds to the simple physical fear the much worse fear of fear itself.

Foolish fears can be gradually eliminated by familiarity with the feared objects or animals, provided no painful or frightening experiences occur while the familiarity is being acquired. For example, if a child is afraid of dogs, the fear will gradually drop away as he sees other children playing safely with them, and as he himself ventures a little nearer each day with no ill effects. On the other hand, efforts to force an immediate approach will intensify the fear.

Fear is such a powerful motivating force that parents and teachers of the past have made excessive use of it, often with disastrous results. Anxieties that undermine health, interfere with normal development, and sometimes persist into adult life, causing severe neurotic conditions, have been traced back to fears deliberately planted in childhood as a means of controlling some undesired form of behavior. For example, frightening warnings about the evil consequences of masturbation have been shown to cause more damage, mental and physical, than the habit itself could possibly have caused.

Just as danger, actual or imagined, is the stimulus for fear, so the stimulus for anger is interruption of the individual's activity. When the activity is directed toward the satisfaction of some biological need or the escape from real or fancied danger, then the stimulus for anger becomes a stimulus for fear also. Fear and anger commonly occur together. Either may lead to expressions commonly associated with the other. Flight is the normal expression of fear, but the cornered animal will fight. Parents who try to maintain discipline through appeals to fear are often bewildered at the number and variety of behavior problems that their children display. The misbehavior is commonly the child's way of punishing the adult who has frightened him or humiliated him.

Aggressive behavior is the normal expression of anger, but when the individual's anger is roused against someone he loves, he sometimes becomes afraid of his own impulses and shows all the symptoms of a severe anxiety attack.

Many unexplained illnesses of infancy and

childhood, especially digestive disturbances, probably have their origin in disciplinary conflicts with parents.

The surest way to arouse the anger of a baby is to hold down his arms and legs, impeding his movements. The need to exercise the growing muscles over which he is just beginning to gain control is a real biological need. Even in adults, prolonged restraint of movement can produce great discomfort, even severe pain, probably due to circulatory disturbances resulting from accumulation of venous blood that would normally be pumped back toward the heart by the pressure incidental to muscular activity. The baby cannot describe his pains nor state his desires. He can only scream and struggle. Tight clothing, tight bedclothes, and all forms of mechanical restraint should be avoided.

Throughout life, but most noticeably in early childhood, emotional reactions are reciprocally connected with the physiological condition. Cannon groups fear, hunger, rage, and pain together as the emergency emotions. Their occurrence prepares the organism for vigorous action, fighting or running, as the occasion may require, and temporarily interrupts digestion and certain other metabolic processes that can wait. This preparation for action includes increased blood pressure, more rapid heart beat, increased tonus of skeletal musculature, a pouring of adrenalin into the blood stream, and numerous other definite bodily changes. Now if the action runs its course, the emotion is ordinarily dissipated, taut muscles relax, the overworked heart slows down, peripheral blood pressure is diminished, blood flows back to the visceral reservoirs, the interrupted digestive processes are resumed, and the entire organism returns to its normal condition. But if the action is inhibited while the emotional stimulus continues to operate, then the state of preparation persists. Muscles remain tense, blood pressure remains high, digestion and assimilation continue to be postponed, while the undigested food putrefies in the alimentary canal, causing pain and distress, and adding more stimulus to fear. A vicious circle ensues.

In contrast to Cannon, who considered fear and anger to be practically identical physiologically, Magda B. Arnold finds evidence that they are as different physiologically as they are psychologically. Fear is characterized pre-

dominantly by sympathetic excitation; anger by strong parasympathetic excitation. Fear is enervating rather than energizing. Activity is diminished in moderate fear; in extreme fear, activity may be prevented altogether. Fear may be useful to the organism, not by preparing for action but by delaying action and enforcing caution. Vasoconstriction and rise in blood pressure are effects of sympathetic stimulation. A parasympathetic reaction commonly results. Arnold finds considerable evidence for a mechanism of alternative reaction, both nervous and humoral, so that extreme stimulation of either the sympathetic or the parasympathetic system will result ultimately in the reactive stimulation of the other. Whether the reaction becomes evident during the emotional stimulation or after it depends on the reactivity of the individual and the intensity of his emotional experience. Arnold contends that both anger and fear are obstacles to efficient action. The emotion which she finds most favorable for activity is *excitement* or *elation*, which is distinct from both anger and fear. Physiologically elation involves a moderate parasympathetic activity without any interfering sympathetic reaction.

Many parents, having heard that emotions of fear and anger are bad for a child's health, attempt to solve the problem by forbidding all outward expression of the emergency emotions, overlooking the value of emotional outlets for the relief of tension. Now it is of course important that even the young child learn to control his emotions. Indiscriminate striking, throwing, kicking, and biting can make him a nuisance to adults and a terror to other children so that he is denied all the satisfactions of being loved and accepted. On the other hand, a child that never takes his own part is not much admired either. Studies of children's attitudes toward aggressiveness in other children indicate that young children do not disapprove of aggressive behavior as much as mothers and teachers are prone to do. Quiet, timid, passive children are more likely to be social isolates than those that are normally aggressive. The goal of emotional training should be rational control and social effectiveness. The child should be helped to observe the outcomes of his own behavior in various types of situations. Through experience, supplemented by sympathetic adult interpretation, he can gradually learn that when he

fights a smaller and weaker child, he is scorned as a bully; but if he fights a larger and stronger child, he is admired. It is a mistake to try to inculcate the idea that fighting is always good or always bad. The capacity for fighting is part of everyone's biological heritage. Attempts to root it out entirely are usually ineffective, and if successful, they would weaken the individual for the struggles of later life.

Bullying of younger children may occur from various causes. (1) The bully is often a child that has been subjected to a great deal of punishment, rousing aggressive feelings which he dares not work off against the adults who have punished him. So he seeks a relatively helpless younger child as a scapegoat. (2) The bully may be suffering from jealousy because he feels that a younger brother has supplanted him in his mother's affections. (3) The bully may be suffering from inferiority feelings, sometimes due to school failure, and he may be seeking to bolster his self-esteem by displays of physical prowess. (4) The bully may have been formerly a weak and timid child, afraid of other children. His present aggressiveness may serve to prove to himself and others that old fears have been overcome. In any case, the first step in dealing with a bully is to seek the cause of his aggressiveness and then try to remove the cause or to provide less harmful outlets for his anger (if it is anger), or more constructive avenues to self-display. Sometimes a dangerous bully is no longer a problem if he is given opportunities to display his prowess in competitive athletics. Sometimes a social promotion to a higher grade will relieve the dull child who hates and bullies his brighter, younger classmates. Sometimes membership in a club of boys his own age will remove a jealous older brother from younger siblings over whom he tyrannizes.

At a fairly early age, a child can be taught that anger increases his available energy, and that this energy can be used for something he wants to do. Many a boy has learned to work off his temper chopping wood. Even the preschool child should have some toys that he is free to throw and a place in which he may throw them.

One therapeutic technique employed in some child-guidance clinics consists in having plenty of cheap play materials, especially dolls, encouraging the child to name the dolls after mem-

bers of his family, and then letting him do what he pleases to them. This seems to serve two purposes, (1) providing a harmless outlet for aggressive impulses, and (2) indicating to the psychiatrists just which family relationships are maladjusted.

Thinly veiled antagonism against one parent, typically the father, is so common as to have received a special name, the Oedipus complex, and to have become the subject of a copious literature. Freud attributed it to the boy's jealousy of his father in the rivalry for the mother's love. A more plausible explanation is the fact that the father is usually the punishing parent, many mothers preferring to delegate this unpleasant role to their husbands and some fathers finding in it a socially approved outlet for their own pent-up aggressions.

It used to be thought by all educators that the only way to inculcate a good habit was to punish every lapse, and the only way to break a bad habit was to punish every occurrence of it. Hence, it was taken for granted that much punishment during early childhood was an unavoidable phase of education. It has been shown experimentally, however, that rewards are more effective than punishments, and that when punishment is administered, the child is quite as likely to associate it with the punishing person, or the learning situation, or any incidental factor of the environment as with the act the adult is trying to punish. W. K. Estes has found that even with albino rats a response can not be eliminated more rapidly with the aid of punishment than without it. "In fact, severe punishment may have the opposite effect. A response can be eliminated only by a sufficient number of unreinforced elicitations, and this process of extinction cannot proceed while a response is suppressed as a result of punishment. . . . While it is suppressed, a response is not only protected from extinction, but it may also become a source of conflict." This gives experimental support to a conclusion for which much clinical evidence has long been available.

The emergency emotions are aroused only when the individual is inadequate, or at least feels inadequate, for the situation confronting him. Hence, the best safeguard against anxiety and hostility is to build up in the child a realistic feeling of self-confidence, based on experiences of success in progressively more difficult

undertakings. Every actual success increases the child's self-confidence. Every failure weakens self-confidence and lowers the level of aspiration. Hence, our suggestions and demands should be adapted to the individual child's actual abilities.

Intellectual and Linguistic Development.

Curiosity is the most effective motivation for intellectual learnings. It appears spontaneously in infancy, increases throughout childhood, and finds expression both in exploratory activities and in the asking of questions.

The child's earliest ideas probably come from sensory experiences. Freedom to explore and manipulate at least some part of his own small world is important. Better a cheap toy that he may take apart to see how it works than an expensive one that he may not touch. Better still, simple constructive materials that he can combine and organize at pleasure.

During the first year, every toy should be suitable for sucking, easily sterilized, colored only with certified food colors, light enough for the baby to handle, and not small enough to be swallowed. For later years, one good rule is, "The smaller the child the larger the toy." Large muscles of trunk and limbs come under control before the smaller muscles. A child can push a chair around easily, long before he can guide a pencil with precision. Preschool children delight in building with large blocks and finger painting on large sheets of newsprint stretched over easels. A child's toy should be his own, to take apart and recombine as he pleases. Much of the so-called destructiveness of children is really exploratory experimentation. One theory of mental retardation is that it sometimes represents a disturbance of the exploratory function, caused by severe reproof or punishment for early exploratory activity.

Except for his own meager perceptual experiences, the young child's only source of knowledge is the information imparted by the older members of his family and his neighborhood. Whether this information is retained or forgotten depends largely upon whether it fits into the child's own growing pattern of ideas.

As soon as he is old enough to ask questions, he is old enough to have them answered simply, seriously, and truthfully. He may not understand all the answers, but if he does not, further questions will be elicited, and his

knowledge will grow. Anyone who ridicules a little child's questions discourages his efforts to gain knowledge. Moreover, the fear of being laughed at, planted by ridicule in early childhood, may persist throughout school and college, discouraging him from participation in recitations and class discussions, and preventing him from asking questions to have his difficulties cleared up. Profound discouragement and sensitiveness to ridicule may so retard mental growth as to simulate feeble-mindedness. Anyone who lies to a little child not only builds up confusions and misconceptions which must later be unlearned but also weakens his faith in adults. Parents who impose on a child with the stork myth need not be surprised if a few years later he takes elsewhere his questions about birth and sex and life.

Answers to the child's many questions must of course await his ability to formulate them in words that other people understand. Clear speech is an indispensable tool of intellectual communication. Adults can help a child learn to speak by speaking to him clearly, distinctly, and correctly. The use of baby talk by the adult delays the child's learning of normal speech and may expose him to needless ridicule later on when he goes to preschool or kindergarten. Simple words and short sentences should of course be used. Care should be taken to help the child associate the right word with the right thing. Concrete, perceptual demonstrations should accompany early language training whenever possible. Children of two or three delight in acquiring new words, and frequently point to things, asking "What's that?" The best early language training consists in answering such questions promptly and correctly.

At the opposite extreme from the baby-talking parent but equally disastrous to speech development is the parent who feels obliged to correct every childish error and make the child try again. This leads to self-consciousness and hesitancy in speech, and is thought by some to be a possible cause of stuttering, though other authorities attribute stuttering to a disturbance of cerebral dominance brought about when a left-handed child is forced to use his right hand. All babies and most preschool children occasionally repeat syllables, and this is not considered stuttering when it occurs before the fourth or fifth year. It is a normal phase of the

complex task of learning the motor sequences involved in speech. It occurs more often when the child is excited and worried than when he is calm and secure. Parents who make an issue of it tend to fix a transitory difficulty into a permanent one.

Though numerous writers report cases of stuttering arising when left-handed children are made to write with the right hand, Wallin, Parson, and Morsh, however, all find evidence that it is possible for left-handed children to learn to write with the right hand without any ill-effects on their speech. Apparently the harm is done not by the acquisition of a new skill but by negative teaching methods which make the child self-conscious and unhappy. If a child begins stuttering at any time from any cause, the best remedy is to stop picking on him, not only about speech and handedness but also about other things.

Individual differences in intelligence are apparent even in infancy, becoming increasingly evident with the development of language, and still more noticeable as children progress through school. Though no race, class, or socioeconomic group has a monopoly either of genius on the one hand or of mental inferiority on the other, both casual observation and the results of mental testing indicate that the intelligence of privileged children averages somewhat above that of the underprivileged.

From the time of the early Greeks it has generally been recognized that both heredity and environment play a part in shaping the intellect of the individual, but the relative emphasis on the two has differed at different times and in different places. Aristocratic societies have generally emphasized heredity. The founders of democracies, by predicating their system upon fundamental human equality, seemed logically forced to assume that improved environment and education would lessen the obvious inequalities in human abilities. Hence, democracies everywhere lay great stress upon education.

But the extension of traditional school procedures to all children served at first only to bring the inequalities into sharper focus. Forcing a child of inferior ability to compete daily with brighter children who seem foreordained to excel him is one of the surest ways to make him chronically unhappy, rebellious, and per-

haps delinquent. The believers in equal opportunity were obliged to choose whether to give the children equal opportunity for liberty and happiness (the original goal) by adapting the curriculum to individual abilities and needs or to stick to the obviously disastrous program of identical schooling for all. The schools of France decided to take account of individual differences in intelligence. Alfred Binet, after more than fifteen years of research, gave the world in 1908 the Binet tests, a series of questions and problems, beginning with some easy enough for an average three-year-old, and continuing in groups of increasing difficulty up to tests hard enough for the average adult. The tests have been translated into many languages, restandardized for many national groups, and have been extended upward through three increasingly difficult superior adult levels and downward into early infancy. On the whole, they have been remarkably successful in enabling their users to predict school success not only in the immediate future but over a period of years. Their use has rescued thousands of feeble-minded and dull children from the daily humiliation of failure and made possible their education along lines suited to their abilities. It has also helped progressive educators to sort out superior children for special advantages. Rightly used, intelligence tests are an educational tool of inestimable value.

Unfortunately, some of the early popularizers of the mental test movement believed that they were measuring the child's hereditary endowment. Even when they asked him to define words and work problems in arithmetic, they still thought that they were measuring something hereditary and immutable. The argument was that since practically all the children given these tests had been in public school, they had had equal opportunity to learn the small amount of language or arithmetic required, and failures must be due to deficiency in learning capacity. To clinch the argument, instances were cited of children who had never attended school, yet made scores average or above average for their age. One such instance was a gypsy girl, who may quite possibly have had travel and exploratory opportunities more than compensating for the lack of schooling. Another instance was a boy from a superior home. The most extreme environmentalist would not deny

that the superior home might be a better place to acquire vocabulary and general information than the average school. For many years, a majority of psychologists accepted heredity as the only, or at least the most important, explanation for the failures of children who had been attending school regularly. Only gradually have we come to the realization that not all children sitting in the same schoolroom have an equal opportunity to learn. Some may be so preoccupied with personal matters that they give scant attention to what is going on. Some may need glasses. Some may be suffering from a temporary deafness due to enlarged tonsils or adenoids. Now the occurrence of enlarged tonsils and other anatomical anomalies may depend in part upon heredity, though focal infection is also important. In any case, prompt surgical care is largely a matter of family socio-economic status.

High correlations between the measured intelligence of children and the socio-economic status of their parents were early observed. These were interpreted as further proofs of the success of the tests in measuring hereditary intelligence. It was argued that the unintelligence of impoverished parents was what kept them poor, and conversely, that it was the intelligence of the well-to-do that had enabled them to get ahead. H. M. Skeels, however, has shown that average children when adopted into superior homes may attain the level of superior intelligence. In fact, Skeels found that there was less correlation between the intelligence of adopted children and that of their own mothers than between the intelligence of the adopted children and the presumed intelligence of foster fathers (estimated on the basis of occupational level), in a group of children adopted before the age of six months. H. M. Skeels, R. Updegraff, B. L. Wellman, and H. M. Williams did a controlled experiment on the effects of environmental stimulation in an orphanage preschool project. They found that the experimental group, those who were exposed to the stimulating preschool experience, made on the average measurable gains in intelligence, whereas the control group remained stationary or declined during the same period. There is a growing body of data to indicate that environmental factors may have more effect on the I.Q. than we used to suppose.

At the time when intellectual potentiality was thought to be largely fixed by heredity, the slow learner was considered hopeless anyhow, and hence, it was often recommended that he should leave school at thirteen or fourteen, after having spent the last few years of his school life learning some simple manual skills to help him earn a living. The quick learner was viewed as the hope of the world, upon whom the major educational effort should be spent.

Special classes for children of superior intelligence have proved their worth in New York City and several other places. The regular curriculum is mastered in about half the usual time, and the time thus saved can be devoted to a vitalized, socialized program constituting a real preparation for leadership.

Special classes for dull and defective children, though in existence longer and in more places, have been less successful, the main difficulty being that no matter what euphemistic names we may coin for them, there is no disguising their real significance from the children themselves. The very fact of being placed in such a class is regarded as a stigma and often exposes a child to the ridicule of playmates and siblings. Also, the purposes of these classes have been less constructively defined. In some cases, even the teachers view these children as hopeless, and conceive their teaching task to be simply one of maintaining order and keeping the children busy at something—no matter what—until they are old enough to leave school. In many places, a child is not assigned to one of these special classes until after he is at least three years retarded in regular school. By that time he is profoundly discouraged, and has sometimes adopted the attitude that regular schoolwork will be forever beyond his powers.

Intelligence tests given in the first week of school would make possible the tentative classification of children before reading and other schoolwork were begun. Since failure commonly lowers the level of aspiration, creates inferiority feelings, and sometimes leads to envy and hostility directed against more successful classmates, every possible effort should be made to protect a young child from starting a subject until he stands a reasonable chance of success.

Reading readiness depends upon physiological maturation, sensory adequacy, and a variety of previous learnings. The child's vision should

be tested shortly before reading is begun, to make sure not only that the acuity of each eye is adequate, but also that both eyes function well together. Binocular coordination often matures late, sometimes as late as the eighth or ninth year. The repetitions and reversals that so puzzle teachers are sometimes due to the fact that the child actually sees the same word in two different places on the page, the image from one eye being projected a little to the side of that from the other, and sometimes a little above or below as well.

Hearing acuity is also important to reading readiness if the phonetic method is to be used. It is not enough that the child understands spoken language well enough to obey simple commands. Many partially deaf children learn to interpret correctly the little that they do hear. Adults around them may not suspect the degree of auditory handicap. In some instances, hearing is cut off only in the upper register, so that the child hears vowel sounds correctly but does not hear *s* sounds or *f*'s. In ordinary life situations, the child may guess the meaning of words from the context; but in abstract phonetic drills, he is utterly lost. If the auditory defect is recognized, different teaching methods may be substituted, and the child may learn to read satisfactorily. But if the defect is not understood, the child is usually regarded as stupid, and may soon accept this verdict himself, so that he stops trying.

Besides vision, hearing, and other physiological factors, reading readiness presupposes many previous learnings. Comprehension of meaning rather than mere word calling is the goal to be sought. This implies that the words used in the reading lesson shall already be a part of the child's vocabulary, not just as words repeated after the teacher, but as significant symbols, rich in apperceptive associations. Meanings are built up gradually on the basis of concrete experience. Walks, games, trips in automobiles, trains, and ships, visits to museums, zoos, stores, railroad stations, farms, and factories all help to enlarge a child's stock of ideas. Children from privileged homes are more likely to have had at least some of these opportunities than underprivileged children, many of whom remain day after day and month after month in the same neighborhood without seeing anything that appears to them very new or significant. The chil-

dren of the privileged often spend one summer at the seashore, picking up shells, watching ships, and playing in the surf; the next summer in the mountains collecting pine cones and interesting rocks; and perhaps the next at a children's camp, under the guidance of college-student counselors. To each new school year such fortunate children bring a wealth of new ideas that put more meanings into their books. For the less privileged, the school should supply some of this concrete experience. In cities with museums, teachers can take their entire class to the museum. In the country, the entire class can go on a walk with the teacher along to answer questions and point out interesting things to observe. Sound-motion pictures can almost bring the world into the classroom. Sandtable miniatures are also valuable, enabling the child to comprehend as wholes the things that in actuality are so big he can only see them piecemeal.

Concrete perceptual experiences should be supplied in addition to the formal exercises in reading, writing, and arithmetic throughout the child's school experience. They also supply the answer to the question as to what sort of schoolwork is most suitable for children not yet mature enough to undertake reading with any reasonable hope of success. Particularly if the immaturity is an intellectual one, a program of concrete, meaningful experiences to build up vocabulary and interpret the child's world for him will help to get him ready for the day when he will be able to learn reading.

Another thing that can be done is to build up motivation for reading. Privileged mothers with leisure commonly begin reading aloud to their children when they are only two or three years old, pointing to pictures and interpreting them. Underprivileged women, overburdened with housework, washing, ironing, cooking, and often employment outside the home, may not find any time to read aloud. The child who is read to learns to think of books as pleasant sources of entertainment and to look forward to the time when he will be able to read for himself. This motivation for reading can be built up by the teacher even in children who will not be mature enough to read to themselves for another year or two.

The dull child attains reading readiness much later than his brighter classmates, but experi-

ments have shown that if formal instruction is delayed until reading readiness has been attained, the traditional failures can be eliminated. Reading begun late and pursued with success can be as pleasurable to the dull child as to anyone else. His slower learning rate necessitates devoting more time to repetitive drills, which are quite unnecessary for superior children, and new material must be introduced more gradually to avoid confusing him. Thus, instead of spending fewer years in school than the average child, the children of dull and borderline intelligence should be allowed more years to acquire the minimum of reading, writing, and arithmetic essential to successful living in our literate society. With such a school program, the majority of high-grade morons, many of whom are now supported in institutions for the feeble-minded, could be educated in the public schools and prepared for happy, useful lives in the community.

Binet's predecessors sought to devise separate tests for memory, imagination, reasoning, and other "mental faculties." By emphasizing general intelligence, Binet provided a short cut to practical results.

More recent advances, however, have come through analysis of "general intelligence," as measured by tests, into several component abilities, largely by the technique of factorial analysis.

Revived emphasis upon separable factors in intellectual functioning gives the educator some cue as to how to search out and alleviate the condition that is holding back the intellectual growth of a particular child. For example, Sarah Stinchfield Hawk finds that by remedial speech training she can facilitate general intellectual growth to such an extent that large sudden increases in I. Q. occur. This ought not to surprise anyone who is aware of the extent to which language is fundamental not only to social communication but also to private thinking.

G. D. Stoddard defines intelligence as "the ability to undertake activities that are characterized by (1) difficulty, (2) complexity, (3) abstractness, (4) economy, (5) adaptiveness to a goal, (6) social value, and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces."

Stoddard finds evidence that the development of intelligence, as thus defined, is determined in large part by cultural conditions. He contends that the "possibilities for human development through educative means are far greater than our ancestors supposed."

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CLIMATE AND HUMAN BEHAVIOR.

—That human behavior should be related in any fundamental way to climate will appear to many psychological readers as surprising, if it does not meet with out-and-out incredulity. This situation is only natural, for psychologists have been unaccustomed to noticing the efforts and suggestions of investigators far removed from their own field who have worked on the problem. Yet these investigators have been many since ancient times, and in the twentieth century there are three extensive projects in this country bearing on the subject, all well outside the boundaries of psychology. There is in addition a fourth, the "Kansas project." All of these projects involve psychology, but the fourth is the only one of its kind as yet undertaken by a psychologist.

The problem came to the attention of his-

torians, travellers, slave dealers, military officials, physicians, geographers, and other scientists of ancient Greece, among them Herodotus and Aristotle. Since then hardly a century has passed without its representatives who kept the suggestion alive. Nevertheless, but few in modern times have taken the matter seriously. Up to the present the problem was largely confined to the differences between peoples living in the warmer *versus* the cooler countries. Interestingly enough there has always been a striking agreement regarding these differences. People in warmer countries were said to be more timid, smaller, physically weaker, less courageous, but more inclined to physical pleasures, sexual indulgence and abnormalities; less aggressive, more effeminate, more sensitive, more irritable, more unstable emotionally, more cruel, more conservative; more addicted to immutable laws, to stubbornness, despotisms, and tyranny; more suspicious, more inclined to introspection; more mystical and melancholic; more likely to develop an economy based on slave labor; less conscious of the individual in the social group and hence less considerate of his importance and worth.

On the other hand the peoples and races of cooler countries in more northern regions or at higher altitudes were said to be more vigorous, aggressive, persistent, larger, stronger physically, healthier, gayer, braver in battle, less prone to sexual indulgence but having a higher birthrate. They were more tolerant; treasured liberty more; were more difficult to conquer and to keep under submission; were more democratic; were averse to slavery; they were more honest, trustworthy, less suspicious, more puritanic, more frank, less mystical, less given to reflection, and were more provident in their habits, in short, their traits were on the whole the exact opposites of those found in the warmer countries.

Jean Bodin, famous for his pioneer work in political science in the sixteenth century, made note of these differences, but little attention was paid to the problem again until the eighteenth century. John Arbuthnot, in 1733, said in an "Essay Concerning the Effect of Air on Human Bodies" that governments were "powerless to change the genius and temper of a race against the force of air and climate." In 1748 Montesquieu, in his "Spirit of the Laws," emphasized the problem. Statute laws, he insisted, should

be made to fit the character and temperament of different peoples differently conditioned by the climate in which they lived. In 1743 Buffon, the naturalist, also recognized the situation, and Adam Ferguson, in 1868, evidently influenced by Montesquieu, included a discussion of the subject in his "History of Civil Society." He believed that a temperate climate was the best for mankind, for it produced superior traits on account of its effects on human physiology.

During the nineteenth century a considerable amount of literature was published. Arnold Henry Guyot, a Swiss geographer who migrated to this country, contended in "Earth and Man, Comparative Physical Geography" that the temperate zone was superior both for the physical and social evolution of man. He thought that the changes of the seasons had much to do with the greater vitality that produced superiority in the races of the cooler but not too cold countries. During the middle of the century, Karl Ritter, a Berlin geographer, advanced a geographical interpretation of history in which climate figured in an important manner. His influence led to a school of environmental determinism. Henry Thomas Buckle recognized the problem in 1862 in "The History of Civilization in England," and in 1863, John W. Draper, an eminent American scientist and historian, said that "Where there are many climates there will be many forms of men. . . . For every climate and, indeed, for every geographical locality, there is an answering type of humanity."

Coming now to the twentieth century, Ellen Semple, a student of the Leipzig geographer, Friedrich Ratzel, agreed in general with the long observed differences between northern and southern races and concluded that climatic conditions gave a certain zonal stamp to human temperament and development. Robert DeCourcy Ward, 1902, in "Climate, Considered Especially in Relation to Man" was apparently convinced that this factor is one of the most important of all in the control of human development. J. Russell Smith wrote an "Industrial and Commercial Geography" in 1913 in which he said that cooler climates were a greater stimulus to the activities of nations and races and observed that the larger, more industrialized and aggressive cities of the world were for the most part located between thirty and sixty degrees north latitude. "To an extent little real-

ized," he commented, "environment makes the race."

In recent years Henry L. Moore and Edgar Lawrence Smith, interested in economic and production problems, have pointed out correspondences between economic and certain kinds of climatic fluctuations. In "Tides in the Affairs of Men," in 1939, Smith wrote, "Within the economic pattern of a period, the tidal ebb and flow of mass psychology in response to the rhythms of environmental change cannot be safely disregarded. . . . We need to know much more than we do about these natural rhythms and about the means by which they influence the moods of men, their hopes, their fears, their energies and their lassitudes."

Were all these investigators wrong? Were they crazy? Obviously not. It is patent to any intelligent person that different climates produce different fauna and flora. Why then should they not produce different kinds of people? Yet broach the subject today to many a scientist and one will immediately elicit a blank look of incomprehension, or one will be regarded as a crackpot fit only for the company of astrologers, palmists, and Hindoo prophets!

Not, however, in the estimation of Ellsworth Huntington of Yale, geographer and climatologist, and author of some twenty-eight books and numerous papers all having to do more or less with the influence of climate on human behavior and destiny. Among the more relevant of his works are "Civilization and Climate," "Palestine and Its Transformation," "The Pulse of Asia," "World Power and Evolution," "Environment and Racial Character," "The Season of Birth," and lastly, in 1944, "The Mainsprings of Civilization." His is project number one in this country, begun early in the century.

According to Huntington, climate exerts a strong influence on human behavior, including intelligence, aggressiveness and capacity for work. There is an optimum belt of storminess which, associated with temperatures that are not too extreme, is conducive to better health and higher energy levels. Ozone, he thinks, acts as an important stimulant. The month of the year in which one is conceived is also important. Reproductive vitality is at its height in spring and at its lowest level during the heat of midsummer. In the past, civilizations have sunk into decline, have died out, or the people were forced to migrate, because of changes in climate.

Dr. Clarence A. Mills heads the second extensive project in this country, at the University of Cincinnati Medical School. His two most important books are "Medical Climatology" and "Climate Makes the Man." Extensive studies of mice bred under artificial climates demonstrate that temperature is an important factor in conditioning size, body form, and fertility. High outside temperatures produced a tendency to expand radiation surface. Because the body must be kept at a relatively constant temperature inside, in the presence of high outside temperatures the organism must live more slowly physiologically and remain less active, otherwise body heat cannot escape as rapidly as it is generated and in time fever or death would result. On the other hand, the mice living in lower temperatures underwent a contraction of body surface in relation to weight, an adjustment resulting in more conservation of body heat. Energy level, Mills found, was a function of the ease of maintaining internal body temperature against excessive heat or cold outside.

Here we evidently have the cue of the differences in the behavior patterns of races or peoples living in warm *versus* cool climates. Tropical races have remained relatively primitive. Under conditions of excessive heat, evolution and growth potentials have been cut down. These people lack the vitality to put into their aggressiveness the drive, either mental or physical, possessed by cool climate races.

The third project which continued for a great many years was under the direction of Dr. W. F. Petersen of the University of Illinois Medical School, who wrote a four-volume work on "The Patient and the Weather." As in the case of Dr. Mills, he has done a great deal of statistical work correlating the incidence of different physical and mental diseases with different weather and climatic conditions. Recently he published a very interesting little book, "Lincoln and Douglas, the Weather as Destiny," one implication of which is that introverted personalities stabilize on rising temperature curves and extrovert personalities on falling temperature curves. This is not in the least fantastic.

The fourth project, the one at Kansas, is in its fourteenth year. It began purely by accident when a review of the history of psychology resulted in noticing that the antecedents of Gestalt

and association theory alternated with one another down through the centuries, simultaneously with corresponding shifts in point of view in biology and philosophy. This fact led to a study of the other sciences, then of the arts and literature, then of the political and military history of all the known countries and peoples of the world beginning with ancient times. Up to this point the investigation had resulted in a curve depicting the relative prevalence of individual cultural products, all of which naturally fell into two categories, the one organic and the other mechanistic or atomistic. A culture pattern representing all important phases of human activity was fluctuating back and forth in rhythmic fashion as a vast, complex, but integrated whole or Gestalt, each detail of which was related logically with the others in so intimate and clear a manner that, knowing one of them, the others could be predicted. The major rhythms averaged about 100 years in length but clustered into groups of five, beginning with the middle of the sixth century B.C. The terminations of the 500-year rhythms occurred near the death of Caesar and the turning point in the vitality of the Roman empire; in the fifth century (fall of Rome and its contemporary ancient empires), the tenth (ending the first half of the Middle Ages), and the fifteenth (the fall of the second half of the Middle Ages). The termination of the present 500-year period is due around 1980!

The manner in which climate came to be involved was another accident. While inspecting the culture curve a colleague remarked that it resembled the California sequoia tree ring curve which goes back to 1350 B.C. The author of the project had never heard of such a curve. On investigation it was found that the two curves resembled one another in a manner that could not possibly have been explained by chance. This led to the assumption that the culture fluctuations could have been climatically conditioned, but the culture curve represented practically all of the civilizations of the world, past and present. Was there such a thing as a fluctuating world climate? Huntington had suggested an affirmative answer but no exhaustive work had ever been done in an effort to trace the history of climate over the world as a whole, as far as it could be known. No one had even made a complete comparative study of temperature and rainfall curves as far back as

they go for the world as a whole. The only approximate attempt was made by Brückner in 1890. Accordingly, many years have been occupied in obtaining as complete a picture of the history of climate as possible and the work is yet far from finished. However, the data are complete enough to justify the statement that unless the cultural fluctuations are climatically conditioned, the coincidences violate all the laws of chance and are utterly inexplicable in the light of our present knowledge.

The data warrant the conclusion that there is a world climate, although never completely homogeneous in character; that this world climate has fluctuated in rhythms within rhythms which tend to follow the multiples of the sunspot cycle of 11.3 years; that these rhythms whether long or short tend to follow a similar pattern of phase sequences, the phases being cold-dry, warm-wet, warm-dry, cold-wet, then cold-dry again, in that order.* The 100-year and 500-year climatic rhythms correspond with the culture rhythms already mentioned. Shorter climatic and cultural rhythms superimposed on the longer ones also correspond, frequently down to the single sunspot cycle.

Space does not permit explaining in detail the sources of information regarding the history of climate prior to measured temperature and rainfall. A partial list must suffice: tree rings, lake levels, river levels, drought and flood chronologies from different localities; famines, crop failures, harvesting dates, ice-forming and ice-breaking dates, early and late frosts, reports of excessive heat, cold, storms, snow; clay varves; travel through mountain passes; the receding and advancing of glaciers; formation of bogs; pollen analysis; expansion and contraction of arid regions; data from military posts, monasteries, government records and numerous diaries; data from accounts of campaigns that ran into extreme weather; locust plagues; types of vines and other vegetation; sunspots large enough to see with the naked eye and aurora (both known to be associated with drops in temperature or with cold periods); lengthening and shortening of the sunspot cycle, etc.

Even though individual items run into the

* Cf. Wheeler, R. H., "The Problem of World Climate," *Bull. Amer. Meteor. Soc.*, Vol. 21, 1940, 46-58; *Trans. Kan. Acad. Sci.*, Vol. 46, 1943, 33-51.

tens of thousands, there is no way of telling what the average temperature or rainfall was during a given period, but it is possible to locate the phases of the 100-year cycle beyond much question, and in many instances the phases of shorter fluctuations.

Assuming this picture to be reasonably correct, there is no question but that nations or empires rise and fall on tides of climatic change. Dated international and civil war battles from over the known world since 600 B.C. obtained from around 250 volumes of history, and plotted against the curve, fall so consistently during the warm and cold phases, respectively, or overlap on the transitions from warm to cold or cold to warm, that these battles alone would have located the warm and cold phases of the 100-year rhythms as well as most of the interruptions (smaller superimposed rhythms), if the interruptions were as long as ten years.

The so-called Golden Ages of history generally occur on the transition from the cold to the warm phase of a 100-year cycle which has all of the appearances of being a high energy-level time in history. Occasionally a Golden Age will occur on the transition from warm to cold, but evidently only under certain special circumstances which cannot be discussed here. Never do they occur during the hot-dry or cold-dry phases. Out of 55 sovereigns who have come down through history with the title, The Great, 48 have ruled on this transition. Of 650 rulers, about half of whom the historians characterize as good and half poor, 80 per cent of the good, in the world as a whole, have ruled at the close of a cold and opening of a warm phase. Over ninety per cent of the poor rulers divide almost equally between the hot-dry and cold-dry phases of the cycle. The transition from cold to warm is nation-building time the world over; and the transition from warm to cold is nation- or government-falling time. These correlations hold even for the warrior states of Africa and the East Indies. They hold for the Orient as well as for the Occident, and for the Indian civilizations of the western world in so far as data are available. It should be kept in mind that we are discussing world trends. From time to time there have been lags and leads both in the climate of particular regions and in the shifting of the culture pattern. No known exceptions of any consequence have yet

been found, although there are instances in which the data are incomplete. Where nothing is known of the prevailing climate in a particular country at a particular time, the chances of that country not following the general trend of the 100-year cycle are practically nil. But the summation of all possible exceptions would not materially change the nature of the correlations, for reasons that cannot here be discussed.

Many other types of culture variables are distributed along the climate curve so consistently that any one of them could be used as a criterion of the warm and cold phases of the 100-year cycle. For example, dated migrations regularly cluster during major cold-dry phases from the sixth century B.C. to the nineteenth century. Sometimes they begin, as one might expect, during the preceding hot drought and continue into the cold phase, but they consistently disappear during warm-wet phases when water and food are abundant and nomadic peoples can remain in one region or even build towns or cities. Another example is Baroque art, which is consistently a cold-phase phenomenon.

The types of cultural events that consistently cluster during the various phases of the climatic cycle are shown on the following pages.

The highly integrated character of the culture pattern loses its mysterious character when it is seen that the atomistic or cold-phase pattern in every respect emphasizes the part of anything at the expense of the whole, while the warm-phase, organismic pattern emphasizes the whole of anything at the expense of the part. With a little study of the lists in the table this fact should easily become apparent. It is not so strange, therefore, that algebra is cold and geometry warm; that the cell theory and its antecedents are cold and epigenesis warm; that encyclopedias are cold; and systematic, integrated works, warm.

The hot drought phase is the typical season for despots, dictators, communism, totalitarianism, Gestapos, pogroms, fascism, and decadence in general. And what more logical explanation could there be than that through devitalization from the effect of temperatures much higher than those to which they have been accustomed, people have become irritable and unstable or lethargic and indifferent, depending upon circumstances? Similarly it would seem obvious

TABLE I

<i>Transition Cold to Warm</i>	<i>Warm Wet</i>	<i>Warm Dry</i>
Golden ages National building Great majority of best leaders Revival of learning Rapid commercial development Building of great financial empires Exploration Rise of new aristocracy Centralization of government End of civil war period and beginning of nation-building wars Revolutions setting up strong governments New governments begin democratically Industrial revolutions Relatively high moral tone of society, reflected in manners and methods of warfare Shift from concrete to abstract cultural output Shift from "Romantic" to "Classical" culture Rising prosperity Rapid recovery of rainfall; era of warm floods; storm maximum; climatic instability Lengthening of the sunspot cycle and reduction in number and size of spots	Climax of brilliant period Growth of cities Governments become more rigid and centralized Continuation of international wars of conquest Unifying trends Rationalism Idealism Deduction Universal organismic laws World histories Integration Attributes derived Interrelatedness Emphasis on wholes; primacy of wholes Methodology Principles of balance and equilibrium Geometry Epigenesis; physiology Ecology Symbiosis Stereochemistry Relativity Wave concepts Purposivism Teleology; teleconnections Socialization of human effort Functionalism in art and science Dramatic and philosophical poetry Free and blank verse Dynamic phase in art Monochrome in painting Stylization in art—"streamlining" Abstract trends in art—fluidity—modernism Tragedy; fate Serious opera Dissonance and atonality Antecedents of Gestalt Apperception Psychiatry Revival of Greek mythology Time-mindedness	Period of decay, decline, decadence Pogroms; persecutions; massacres; police systems; despotism; dictators; totalitarianism Communism; fascism Socialism Great depressions Moral decline; nudism; hyper-sex consciousness; climax of sexual abnormalities; increase in promiscuity; decline in integrity of the family; low birth rate Emergence of "fifth columns" Climax of socialization of human effort Substitution of the State for the Church Decline of Christianity Sovereigns become Gods Orientalism in the West Decline in art, literature and science Surrealism Extreme in trend toward the abstract Cultures become subjective and introverted Fanaticism; lethargy Lull in warfare until toward end, when the less democratic nations initiate epoch of nation-falling wars (Hitler typical)

<i>Transition Warm to Cold</i>	<i>Cold Wet</i>	<i>Cold Dry</i>
Recovery in rainfall and period of cold storms and floods Nation-falling wars collapse into civil wars Rebellions; revolts Shift from "Classical" to "Romantic" culture	Revolts Rebellions Civil wars Rebirth of democracy and constitutions Broadening of the franchise Freeing of slaves	Anatomy Field work Classification Description Naturalists Encyclopedias Dictionaries

<i>Transition Warm to Cold</i>	<i>Cold Wet</i>	<i>Cold Dry</i>
<p>From the abstract to the concrete</p> <p>Wars reflect the decadence of societies; more cruelty; "total war"; prisoners and populations enslaved or massacred; climax of lying and trickery</p> <p>Rebellions fought for deliverance from tyranny</p> <p>Decline of recently emerged aristocracy</p> <p>Appearance of large sunspots, and temporary shortening of the single sunspot cycle</p>	<p>New leadership emerging from the rebellious and freed elements of society</p> <p>Decentralization trends</p> <p>Migrations</p> <p>Emigration</p> <p>Individualism</p> <p>Laissez faire</p> <p>Humanism</p> <p>Sentimentalism</p> <p>Naturalism</p> <p>Comic opera</p> <p>Counterpoint</p> <p>Folk music</p> <p>Musicology</p> <p>Emphasis on individual instrument and performer</p> <p>Baroque</p> <p>Rococo</p> <p>Polychrome in art</p> <p>Emphasis on simple, concrete themes—animals, birds, flowers, domestic life, romance</p> <p>Emphasis on details; parts</p> <p>Lyric poetry</p> <p>Simple rhyme</p> <p>Sentimental songs</p> <p>Descriptive novel</p> <p>Realism</p> <p>Cell theory; pathology</p> <p>Preformation</p> <p>Algebra</p> <p>Statistics</p> <p>Particles and infinitesimals; primacy of parts</p> <p>Induction</p> <p>Empiricism</p> <p>Hedonism</p> <p>Utilitarianism</p> <p>Skepticism</p> <p>Epicureanism</p> <p>Atomism; specialized laws</p> <p>Structuralism</p> <p>Attributes innate</p> <p>Behaviorism</p> <p>Associationism</p> <p>Sensationism</p> <p>Revival and spread of Christianity; missionaries</p> <p>Travel</p> <p>Intermingling of cultures</p>	<p>Lexicographers</p> <p>Geographers</p> <p>Concrete inventions</p> <p>Proletarian culture as opposed to aristocratic</p> <p>Materialism</p> <p>Atheism</p> <p>Space mindedness</p> <p>Anarchy; vigilantes; "assassins"; Ku Klux Klans</p> <p>As it turns dry, output lessens</p> <p>During cold drought maximum a lull in human activity and depression on cold side</p> <p>Decline of pattern tends to set in</p> <p>Dilletantism; bombastic; "showy"</p> <p>Elaborate and adorned costume</p> <p>As warm period nears, rebellions and revolutions increase and a new leadership emerges that finally sets up a strong government and nation-building wars begin again</p>

that the Golden Age period occurs where both temperature and rainfall and sufficient variability in humidity and temperature following a revitalizing cold period have raised the human energy level to its maximum, along with conditions adequate for economic prosperity.

Patterned after the experiments of Mill on

mice raised in artificial climates, rats were studied for four generations in the psychological laboratory at Kansas. Hellmer divided several hundred newly weaned white rats into three colonies. As nearly a third as possible of each litter was placed in a room of 90 degrees constant temperature, another third in 55 degrees,

and one third at ordinary room temperature. When the rats had reached the age of twelve weeks Hellmer studied their performance in a simple, four-alley maze with the following results:

TABLE 2*
1ST GENERATION

Group	No.	Trial Mean	Errors Mean
Cold	49	21	133
Control	45	26	149
Hot	35	54	297
2ND GENERATION			
Cold	43	22	135
Control	46	29	156
Hot	36	48	269

* See Hellmer, L. A., "The Effect of Temperature on the Behavior of the White Rat," *Amer. Jour. Psychol.*, Vol. 56, 1943, 408-421.

Moore subsequently repeated Hellmer's work, obtaining essentially similar results, and then moved one third of the "hot rats" to the cold room with a delay period in the control or "normal" room, one third into the control room, and kept one third in the hot room. The cold-room rats were treated in a corresponding manner, while one third of the control rats were moved to the hot room and one third to the cold room. After the rats had lived in their new environment thirty to forty days, they were tested in the maze for relearning. Moore's results were as follows:

TABLE 3*

Group	Mean of Trials	Mean of Errors	Number
Cold rats			
a. In cold room	7.1	17.4	14
b. In control room ...	9.8	31.8	17
c. In hot room	13.0	50.6	14
Control rats			
a. In cold room	7.9	31.3	14
b. Left in control room	11.3	40.0	15
c. In hot room	18.8	70.4	15
Hot rats			
a. In cold room	8.2	28.9	16
b. In control room ...	10.5	36.5	15
c. In hot room	16.5	47.6	14

* From Moore, K., "The Effect of Controlled Temperature Changes on the Behavior of the White Rat," *Jour. Exper. Psychol.*, Vol. 34, 1944, 70-79.

In a period not longer than forty days the hot rats moved to the cold room approached the performance of the cold rats, and the cold rats in the hot room approached the performance of the hot rats.

The behavior patterns of the hot and cold rats were very different, and differences in body structure agreed with Mill's findings on mice. The differences in the two patterns of behavior showed many resemblances in a general way to the recognized differences in the behavior of warm- and cool-climate peoples, even to their sex behavior. The hot rats noticed each other more as evidenced in sniffing, regardless of sex, or whether the female was in heat, yet were less interested and vigorous during mating time; while the cold rats were far more "modest," yet more vigorous at the appropriate time. The litter rate in the hot room declined rapidly until sterility was so prevalent that the colony had to be replenished. Litters and progeny were small—the rats themselves were much smaller. In the second generation two litters a year were average. In the cold room, litters were much larger and averaged between four and five a year.

The hot rats were relatively vicious, bit their keepers occasionally under no apparent provocation, were erratic in the maze, showed many "neurotic" traits, frequently mutilated or ate their young, and were little interested in raising them. Opposite "traits" characterized the cold rats.

From these results it was concluded that temperature has much to do with the conditioning of the organism's vitality or energy level, hence its intelligence, aggressiveness, stability, and many other characteristics.

One aspect of the Kansas project has to do with efforts to predict the general trends expected in the immediate future, both climatic and cultural. The data indicate that we have just completed a warm phase which began in the neighborhood of 1900 (the last cold phase began around 1830 and lasted with interruptions to 1895 or 1900. The preceding warm phase began around 1790 and, with a break centered on 1815, lasted until 1830.) The last hot drought phase of the 100-year rhythm centered in the first half of the 1930's and brought with it the usual epidemic of dictators, depressions, and decadence. The data indicate that we

are in the cold-wet phase now; that the "bottom" of the temperature and rainfall curves for the world as a whole should be reached in the 1980's in which a severe cold-drought should center; that there is a good chance for an interruption of the cold period and a shift to the warm side for possibly as long as ten years in the 1950's or 1960's, but that the next main ascent to the warm side should not occur until around 2000 or 2010 A.D.—the next major nation-building age of history. The variables in the table constitute in each case an experimental "prediction."

Human ecology is bound to be one of the important branches of science in the future. World leaders of today should be cognizant of the fact that an intensive study of the climate of the past will ultimately lead to accurate predictions of trends far ahead into the future, and that the climatic phases of the future will probably produce the same types of cultural and behavior problems as they seemed to have produced in the past, over and over again, by controlling man's vitality or energy level. Much can be done by way of guaranteeing world peace when the underlying causes for man's temperament, aspirations, and changes in mood are realized. Specific problems can be anticipated in advance and solved before social forces get out of control. Moreover, universal air-conditioning should be helpful in making people more alike, thus leading to better mutual understanding!

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CLINICAL PSYCHOLOGY.—Clinical psychology is the scientific study of the mental processes of individuals in need of diagnosis and therapy because of symptoms of intellectual or emotional maladjustment. The closest proximate disciplines are those of neurology and psychiatry on the one hand, and education and sociology on the other.

The first test instruments devised for use in this field were intelligence scales for sorting out individuals of such inferior ability as to be in need of segregation either in institutions or in special classes. When these intelligence scales were applied to the task of measuring the ability of individuals already segregated as feeble-minded, it was found that all levels of

ability were represented among those adjudged to be feeble-minded because of persistent behavior disorders. On the other hand, many individuals in penal institutions were found to earn feeble-minded ratings, and to be in need of permanent guardianship.

As the need for finer measurement was felt, the scales were revised, extended at the upper levels and refined. This process still continues.

The Binet-Simon Scale in its various translations and revisions was welcomed as a god-send, but soon demonstrated its limitations as well as its sphere of usefulness. Following the construction of a variety of non-verbal tests, the Pintner and Paterson Scale of Performance Tests was constructed in an effort to organize these separate ratings into a single one with greater meaning. Successive performance scales have been constructed with improved statistical method resulting in increased predictive value. This process, also, still continues.

As studies of normal child development were carried out with increasing care for detail and accuracy of observation, new norms were obtained for evaluating the behavior of clinical patients.

The standardization of batteries of tests of school achievement offered a new means of evaluating the relative strength or weakness of the clinic patients in various school subjects. To these were added tests of mechanical ability in the hope of finding a field in which the maladjusted individual could make a comfortable adjustment. It was soon discovered that mechanical aptitude was less important for many individuals than mechanical interest. This discovery was followed by the construction and publication of a variety of "interest tests."

In the meantime, an effort was being made to measure certain behavior tendencies along with their emotional concomitants, objectively. This was attempted by obtaining a large number of subjective judgments from an individual. The classification of these responses yielded results that frequently were more revealing than any single subjective statement would be likely to be. As norms became better standardized, the results became increasingly valuable. A refinement of this kind of questionnaire is the card-sorting test of the type of the Multiphasic Personality Schedule which yields responses that fall into different patterns for different types of individuals and for different kinds of mental

disorder. These patterns are of interest in studying differences of emotional and behavior pattern in different cultural groups, and are of practical use to the psychological clinician in revealing tendencies toward abnormality of thought, feeling and behavior, in adolescents and in adults of both sexes.

The ink-blot test was used as early as 1895. It was organized as a clinical instrument by Rorschach. In 1930 Beck reported *Personality Diagnoses by Means of the Rorschach Test*. The clinical psychologist can now compare ratings on two standardized tests for individuals in whom marked deviations from the normal personality are suspected.

During the first years of measuring objectively and quantitatively the most easily observed characteristics of mental ability and disability, psychologists were preoccupied with the growth process and the successive steps leading to mental maturity. Clinical psychologists were often aware that their measuring instruments were not suitable for use with many adults, especially those with little education and limited experience. Babcock in 1930 reported an experiment in the measurement of mental deterioration, and in the same year Conrad published a report on the decline of intelligence. Other reports followed. In 1939 the Wechsler-Bellevue Scale presented norms of deterioration comparable to the norms of growth in common use.

With the development of scales for measuring different kinds of abilities, clinical psychologists have attempted to identify patterns of success and failure that tend to accompany specific types of behavior in life situations. The clinical value of many tests has been enhanced by reports of this kind of observation.

The work of the clinical psychologist supplements and is supplemented by that of the neurologist and psychiatrist, the school and the social worker. He observes the same phenomena as those working under these other disciplines. His special field is the measurement and statement in quantitative terms of facts observed and reported in subjective terms by other observers; and the interpretation and generalization, based on an accumulation of quantitative data (norms) of the facts that he reports. This interpretation and generalization constitutes both diagnosis and the basis for therapy.

The psychiatrist bases many of his judgments upon subjective norms built up through years of experience. The clinical psychologist bases many of his diagnoses on just such subjective norms in fields where quantitative data are lacking. However, it is the aim of the clinical psychologist to replace subjective norms with objective norms as rapidly as possible by the accumulation of quantitative data obtained under controlled experimental conditions.

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COLOR.—Color is a visual sensation normally produced when certain electromagnetic waves stimulate the retina. The longest visible rays are red of about 760 m μ . The shortest are violet. The shortwave limit of visibility is usually given as about 385 m μ , but W. Friedrich and H. Schreiber have recently (1943) reported that for young adults (17 to 30) it approaches 313 m μ and that for young children (around 6 years) the short-wave visible limits lie between 297 and 302 m μ . Thus it is probable that young children see radiations invisible to adults.

The color seen depends upon the wave lengths reaching the eye and also upon the condition of the retina at the time. "White lights" are mixtures of different wave lengths. By means of a prism and in various other ways, the component wave lengths may be separated and each of these appears brilliantly colored. Different "white" lights vary considerably in physical composition. Skylight at noon is often taken as the standard. This is bluer than direct sunlight and much bluer than most artificial sources of illumination. Yet the eyes ordinarily adapt to changing illumination so that few alterations in the colors of most objects are noted.

When an opaque object reflects skylight or sunlight without altering the proportions of the wave lengths in the visible range it is white. If it absorbs all rays falling upon it, it is black. If it absorbs some and reflects others, it is colored. The more nearly homogeneous the reflected rays are, the most vivid or saturated is the color.

If a body between the eye and the source of light permits all the visible rays to pass unchanged, it is transparent and colorless. If it reflects or absorbs some rays and permits others

to pass, it is colored, and the color frequently appears to extend throughout its depth, becoming a tridimensional or bulky color.

David Katz has called attention to the fact that colors as commonly seen have various spatial and textural qualities. He recognizes three main groups: (1) surface colors which appear to be located on the surface of some object and to partake of its physical texture, (2) bulky colors (*Raumfarben*), which appear to have definite tridimensionality, such as colored liquids and glowing coals, and (3) film colors (*Flächenfarben*), which appear soft and hazy, with neither definite depth nor definite superficiality. The blue of the sky is a typical film color. So is the gray or brown field of the closed eyes. Any color can be made to appear soft and filmy when viewed through holes in a screen, cutting off the normal kinaesthetic cues to localization and objective reference.

Spatial and textural qualities then disappear, and colors vary only in three attributes: hue (called also color-tone), brilliance (called also brightness, luminosity, value, and tint) and saturation or purity (called also *chroma*).

The principal spectral hues arranged in order of decreasing wave length are red, orange, yellow, green, blue, and violet, though many intermediate hues have been distinguished and named. The range of wave lengths for different hues has been variously estimated by different observers. Abney's estimates were: red, end to 620 m μ ; orange, 620 m μ to 592 m μ ; yellow, 592 m μ to 578 m μ ; green, 578 m μ to 500 m μ ; blue, 500 m μ to 464 m μ ; ultramarine indigo, 464 m μ to 446 m μ ; violet, 446 m μ to end. Listing's estimates were: red, 723 m μ to 647 m μ ; orange, 647 m μ to 585 m μ ; yellow, 585 m μ to 575 m μ ; green, 575 m μ to 492 m μ ; blue, 492 m μ to 455 m μ ; ultramarine indigo, 455 m μ to 424 m μ ; violet, 424 m μ to 397 m μ . In a continuous spectrum, the different hues appear to merge into each other with no sharp line of division between them. It is impossible to say exactly where one color ends and another begins.

Nevertheless, four hues seem more fundamental than the rest: red, yellow, green, and blue. In every language, the names of these colors are so old that the objects from which the names were derived are forgotten, whereas for most other hues, such as orange, violet,

indigo, peacock, *verdigris*, etc., the only color name is the name of some fruit, flower, plant, bird, mineral, or chemical. Moreover, in popular speech, the names of the four principal colors, red, yellow, green, and blue, are used in describing all other colors.

Both physicists and psychologists commonly refer to homogeneous radiation of any visible wave length as "monochromatic" light because from a physical standpoint it is simple and unitary, and we shall henceforth use the term "monochromatic" in this purely physical sense without further qualification. Psychologically, however, sensations evoked by certain "monochromatic" rays often appear to be mixtures of two adjacent colors, such as blue and green; and conversely, a sensation evoked by a mixture of colored lights, such as red and green may appear as a single color, yellow, which from an introspective point of view is absolutely different from the colors that would be evoked by the same stimuli acting separately, and is indistinguishable from the yellow produced by monochromatic light.

The hue of any "monochromatic" light may be perfectly matched by mixing in proper proportions other lights of neighboring wave lengths. Thus, a mixture of red and yellow gives orange. Violets and purples are obtained by mixing red and blue. Some of the purples, psychologically intermediate between red and violet, can be obtained only by color mixture, because there is no monochromatic light which will evoke them. Introspectively these purples appear as simple and unitary as most of the spectral colors, with the exception of pure red, yellow, green, and blue.

Mixing lights of different wave lengths frequently results in a loss of saturation. The less saturated a color becomes, the less noticeable is its hue, until a point is reached at which hues become indistinguishable, and the colors (sometimes called "neutral colors") differ only in brilliance (or luminosity). Maximum luminosity is known as white, minimum as black, and the intermediate shades as grays. Theoretically there should be only one white and one black, but the term white is commonly applied to any of several light grays and the term black to any of several dark grays. Thus a piece of "black" paper may be "blackier" than the blackboard, a piece of "black" velvet "blackier" than either, and none of them as black as the interior

of a dark box seen through a small opening. Likewise, three or four specimens of "white" cloth may differ greatly in "whiteness" and none of them will be as white as snow. The terms "black" and "white" when applied to ordinary objects are terms of convenience rather than precision.

Some authorities, following popular usage, reserve the name color for sensations of definite hue, and refer to black, white, and grays as "colorless lights." White (or gray) can be produced by a mixture in proper proportions of red, blue, and green lights. It can also be produced by mixing red, green, and violet in somewhat different proportions, using less red this time. It can also be produced by mixing any of several pairs of colors, known as complementaries. For every hue there is another hue, its complementary, which when mixed with it in proper proportion will give a neutral color or colorless light. Thus, the complementary of a red of 656 m μ is a blue-green of 492 m μ ; the complementary of an orange of 608 m μ is a blue of 490 m μ ; that of a golden yellow of 574 m μ is a blue of 482 m μ ; that of a greenish yellow of 564 m μ is a violet of 433 m μ . The white lights produced by these mixtures are indistinguishable when equated for brightness.

Most investigators have regarded three or four colors as "primaries," believing all other colors to be mixtures of these. Different sets of so-called "primaries" have been proposed according to the different kinds of facts the investigators had in mind. For example, in the fine arts, the primary colors are often taken to be red, blue, and yellow, because certain paints and inks of these colors can be mixed to obtain all other hues. In physics, on the other hand, the primary colors are sometimes taken to be red, blue, and violet, and sometimes to be red, blue and green, because colored lights of either of these sets of three "primaries" can be combined in such a way as to obtain every other color.

In discussing color mixture, it is necessary to distinguish sharply between additive mixtures (mixtures of colored lights) and subtractive mixtures (mixtures of pigments). Every colored material absorbs light of certain wave lengths and reflects light of other wave lengths and may also transmit light of still other wave lengths. When artists speak of "mixing colors,"

they refer to the mixing of pigments, which consist of small particles of material chosen because of their property of reflecting light of definite wave lengths and absorbing light of other wave lengths. Paints and inks consist of finely divided pigments suspended in oils or other liquids. When paints are mixed, each pigment continues to absorb its own characteristic absorption spectrum, and the light which is finally reflected from the mixture is whatever is left. For example, a blue pigment might absorb all red, yellow, and orange rays, and reflect all the blue and part of the green and violet. A yellow pigment might reflect the red, orange, yellow, and green, but absorb the blue and the violet. Now when these two pigments are mixed, the only color not absorbed by one or the other of them is the green. Hence, the mixture will appear green. Thus, the artist's process of mixing colors is a subtractive one.

The mixtures of physicists and psychologists, on the other hand, are additive ones. There are three or more different methods of attaining such a mixture: (1) by superposing parts of different spectra, (2) by arranging a system of reflectors to transmit light from different sources, or reflected from different colored surfaces, along a common path to the retina, and (3) by rapidly rotating a disk with sectors of different colors. This last method is the simplest and most widely used. Its invention is attributed to Sir Isaac Newton. The retinal impression of each color persists for about 1/30 of a second, and when the disk rotates rapidly enough, the colors appear to blend. By measuring the angles of the different sectors, it is possible to make precise specifications of the amounts in which any group of colors is mixed to match any other color.

Persons who require three spectral colors to match all other colors are known as trichromats. These include all persons of normal vision, and some whose color mixtures differ markedly from the average and who are therefore known as "anomalous trichromats." In 1881 Lord Rayleigh discovered that apparently normal people may require very different amounts of lithium red (670 m μ) and thallium green (527 m μ) to make a mixture matching sodium yellow (589 m μ).

There are many persons (estimated as about 4% of males and .4% of females) who can match all colors by a mixture of two spectral

colors, and are therefore known as dichromats. All color matches made by normal persons are recognized as such by dichromats, but the converse is not true. Hence, dichromats do not possess any variable which normal persons lack but they lack some variable which normal persons possess. Dichromats recognize blue and name it correctly, but they confuse red, green, and yellow.

There is some evidence that dichromatism, or partial color blindness, is hereditary as a sex-linked Mendelian character. (See *heredity*.) Nevertheless, attempts have been made to improve color vision by feeding Vitamin A, particularly after the spectacular success attained in improving night vision and increasing the speed of dark adaptation by feeding Vitamin A. The extent to which this method may be helpful with color vision is still in dispute. H. Cadan (1943) has used a combination of vitamins, tincture of iodine, and electrical stimulation in the attempt to treat color blindness. In 1942, K. Dunlap and R. D. Loken reported success in treating color blindness with Vitamin A. Such treatment sometimes enables a patient to pass a color vision test on which he has previously failed. The permanence of the cure is not known, but even if the continuance of high vitamin feeding were required to maintain visual efficiency it would be well worth while, both from the standpoint of the individual and from that of society. In the same year, J. H. Lepper reported cases of reconditioning the color-blind by practice with visual filters. Obviously these cases could not have been true color blindness in the ordinary sense of the term. E. Murray has pointed out that the old hard-and-fast categories of color blindness are a handicap to understanding individual variation in color deficiency. According to E. G. Boring, the distribution of color sensitivity is not bimodal, as is sometimes supposed. It is probable that the number of trichromats with varying degrees of anomaly in their color vision considerably exceeds the total number of dichromats.

Early discovery of the extent to which color blindness runs in families also led to premature emphasis on hereditary factors and neglect of the possibility that some cases may be dietary rather than hereditary.

Furthermore, premature explanations of color blindness in terms of color theories led to a hasty assumption that blindness to a particular

color at least ought to be an all-or-none phenomenon.

In 1937, Seebeck discovered that two groups of dichromats can be distinguished. One of these has the red end of the spectrum shortened and the region of greatest luminosity shifted toward the green. For the other, the entire spectrum is visible and the relative luminosities of the various wave lengths are approximately the same as for the normal eye.

Partially color-blind persons are often unaware of the extent of their own defect. Guided by shapes, variations in brightness, and objective context, they often call colors of objects by their right names, but are confused as to the colors of lights.

Because of the use of colored lights as signals on highways, railways, and ships, detection of the partially color-blind and their exclusion from occupations in which color confusion might create a hazard is of the utmost practical importance. Railroads require color vision tests for all their engineers. Some states now require a color vision test for an automobile driver's license. Navigating officers, aviators, and officers and personnel in many branches of the armed services require perfect color vision for the adequate performance of their duties.

Many different tests of color vision have been used. One of the oldest is the Holmgren test, in which the subject is required to match colored skeins of wool. It is said that sailors sometimes object to this test on the ground that it is "effeminate." They readily cooperate in a test with colored lanterns, because this appears more practical and more obviously relevant to the duties of their profession. Nevertheless, lantern tests are less reliable in many cases, because differences in brightness of the colored lights provide secondary cues which enable the color-blind subject to name correctly colors which he does not really see. The Board of Trade lantern eliminates this possibility by making all the lights of the same luminosity. The Ishihara test and several others patterned after it make it possible for the examiner to discriminate between genuine color blindness and malingering. The test material is a series of cards with pink and green dots. The different dots vary slightly both in hue and in brightness value; but for the person of normal vision figures formed by pink or reddish dots stand out upon a background dotted with green in the case of

some cards, whereas figures formed by green dots stand out against a pink-dotted background on other cards. But for the dichromat who sees no pink and green totally different figures may be formed in dots of blue and yellow (or brown), because dots of purplish pink and bluish green will both appear blue, whereas dots of yellowish green and pinkish orange will both appear yellow. Therefore color-blind persons can read some figures that are not legible for normal persons and vice versa. Hence when a subject who is not illiterate claims that he cannot read any of the figures on the cards, there is a strong presumption of malingering. Minor anomalies of color vision, too slight to be detected by ordinary tests, can be measured by Nagel's anomaloscope, which employs Lord Rayleigh's method of mixing red and green in measured amounts to match yellow.

There has been much dispute as to what the partially color-blind actually see, and too often their vision has been described *a priori* in terms of one or another of the color theories. Though color defects are usually binocular, several cases of monocular color blindness have been reported in the past 65 years. In these cases of course the subject is able to make direct comparisons between what he can see with the normal eye and what he can see with the defective eye. Such cases are unanimous in reporting that the color-blind eye sees blue and yellow but not red and green nor any of the other hues. Pure greens and reds are seen as yellows, a bluish-green as blue, and a purplish red also as blue. The patterns seen by the partially color-blind in the Ishihara test afford further confirmation of this fact.

These facts of partial color blindness are among the important evidence that yellow ought to be included among the primary colors. Another important item of evidence in favor of yellow is the fact that it can be seen over a wider area of the retina than either red or green.

In normal eyes there are three retinal zones, a central zone, surrounding the macula lutea, in which all colors are perceived in their true hues, an intermediate zone in which no colors are seen except blue and yellow, and an outer zone in which all colors appear as grays. (Some observers, however, report that if colored stimuli are sufficiently intense, they can be seen

in their true colors to the periphery of the retina.) Much experimental work has been done upon the mapping of the zones of the retina. Their size and shape differ noticeably in different eyes. In passing from one zone to another, most colors appear to change in hue. An orange, for example, will appear as a gray shadow in the periphery. In the intermediate zone, it will appear as a dull yellow. Only in the central zone will it be seen as orange. Both reds and greens are seen as yellow in the intermediate zone, though Ferree and Rand have found that red stimuli are recognized as such at a greater distance from the fovea than are green. There is one pair of colors, a bluish red and a bluish green, which disappear abruptly at the edge of the central zone, their stimuli being seen as gray in the intermediate zone. Hering regarded these as "primary" colors, along with blue and yellow. Yellow and blue are distinguished in their true colors over a wider area of the retina than any other hues. This is evidence that both of them are primary colors.

The most conclusive evidence in favor of blue was recently (1944) established by G. F. Göthlin in a series of experiments on the threshold energies for the appearance of color in spectral light of wave lengths varying from 430 to 455 mμ. It will be noted that these wave lengths fall in the range of Listing's ultramarine indigo, a hue beyond the pure blue toward the violet. As the energy of the stimulus was increased from zero, all of Göthlin's observers first named the color as blue, and only when the energy was made several times greater was another component identified. No observer reported the appearance of violet or green before blue. Now if blue were a blend of green and violet (as some physicists still maintain), then we should expect the primary present in greatest abundance, which in this case would be violet, to be visible at a lower energy level than the blue; but the reverse is the case. Hence it seems evident from Göthlin's experiment that blue is the short-wave fundamental color and violet is not a fundamental color but a blend.

Every color tends to induce its complementary upon its immediate surroundings. This phenomenon may be demonstrated by mounting a patch of saturated color upon a neutral gray background and eliminating contours by covering with gauze or thin tissue paper. Under

these circumstances, the gray background will appear tinged with the complementary of the brightly colored patch. By this means, the same piece of gray cardboard can be made to appear bluish, brownish, lavender, pinkish, or bluish-green, according as it is made the background for yellow, blue, green, blue-green, or red. Artists make use of this phenomenon to enhance the apparent saturation of their colors by placing contrasting colors side by side.

When a patch of color is fixated steadily, its saturation gradually diminishes. It is almost as though a gray cloud were forming between the color and the observer. This phenomenon is known as *adaptation*. Adaptation also occurs when one wears colored glasses or remains under colored illumination. When red glasses are first put on, all the world looks red. Soon, a few other colors can be distinguished, but white things still appear to have a reddish tinge. Eventually, however, all objects appear in their true colors. Then, when the red glasses are taken off, everything appears abnormally bright, and white objects have a bluish-green tinge; but in a short time, varying somewhat with different observers, all things resume their normal appearances. Similarly when artificial lights which have an orange hue are first turned on, the orange color is clearly perceptible. In a few minutes, however, the orange has disappeared and practically all objects in the room have their natural colors. If one then looks out of the window into the gathering twilight, objects out of doors appear bluish. In general, whenever one is adapted to illumination of any definite hue, objects illuminated with white light appear tinged with the complementary of that hue.

If after steady fixation of a brightly colored area one closes the eyes or looks away at a neutral background, the complementary of the color is seen. This is called the *negative after-image*. The negative after-image is of the same general shape as the stimulus, but the outlines are more vague. The size can be made to vary according as one projects the image upon a distant background or a surface near at hand. The farther the image is projected, the greater is its apparent size. Presumably the after-image area on the retina is nearly the same as that occupied by the original stimulus, or slightly larger at first, diminishing as the after-image fades out. If a negative after-image is projected

upon a colored background, its hue blends with the background, following the same laws of color mixture as those established with the color wheel.

The complex interrelationships among colors become more intelligible when the colors are arranged according to some spatial schema. Leonardo da Vinci arranged the colors in a square with red, yellow, green, and blue at the corners, secondary hues along the sides, and tertiary or unsaturated colors inside. Sir Isaac Newton proposed two different spatial arrangements, the circle and the triangle. Spectral hues are arranged around the circumference of the circle with purple bridging the gap between red and violet. Colors of decreasing saturation occupy the space from the circumference inward toward the center, at which is white, or colorless light. The distance of a point from the center is a measure of its saturation. In Newton's color triangle, red, green, and violet are at the corners. Newton's diagrams specify hue and saturation adequately and also indicate which colors can be mixed to form other hues and what proportions are required; but they provide no means of representing the third variable, brilliance or value. Lambert proposed a tridimensional figure. Titchener achieved a geometric representation of all the important facts of color mixture by his double pyramid, with white at the upper apex, black at the lower apex, the complete series of grays on a line joining these apices, the saturated colors around the outer edge of a quadrilateral base, with one of the four primaries (red, blue, green, and yellow) at each corner, and the base so tilted as to take account of the greater brightness of yellow and the relative darkness of red and blue. Dark shades are represented in the lower half of the double pyramid and light tints in the upper half. Decreasing saturation is represented by a closer approach to the center line. Complementaries lie at opposite ends of straight lines passing through this center line.

In dim light, ordinary colors are not seen. All objects appear black or gray. Faint lights appear white, whatever their wave length. There is considerable evidence that the mechanism for night vision, or vision in dim light, is entirely distinct from that of ordinary daylight vision. Night vision is thought to be mediated by the rods of the retina, daylight vision by the cones.

Rods are absent from the fovea and most abundant at the extreme periphery of the retina. Cones are thickest in the fovea, becoming fewer and fewer farther out, and are practically absent from the extreme periphery. For ordinary daylight vision, acuity is greatest at and immediately around the fovea, but the fovea is blind to very dim lights. A dim star which is plainly visible in indirect vision disappears when one looks directly at it.

Night vision is commonly called "twilight vision" because some of the most interesting phenomena connected with it were first observed in the twilight, or period of transition between ordinary daylight vision and night vision. At this time, reds become very much darker, gradually changing to black, and blues become pale and silvery. There is a shift in the brightest part of the spectrum from yellow toward the green. The brightness distribution in night vision is identical with that of the totally color-blind, and with one type of partially color-blind, and with that of the periphery of the normal eye at all times.

The transition from daylight vision to night vision is ordinarily gradual, dark adaptation requiring a varying period of time in different individuals. The frequency of night flying in the Second World War brought problems of night vision and dark adaptation into sudden prominence. Pilots must look alternately at a lighted instrument board and into the outer darkness. Their ability to see in the darkness is of utmost practical importance. Hence there have been many recent research studies concerning various factors related to dark adaptation. M. E. Yarbrough and W. J. Dann have found low but positive correlations between dark adaptometer measurements and blood Vitamin A. The chemical structure of the visual purple, the photosensitive substance in the rods now known to be the substance involved in night vision, is related to that of Vitamin A, and there seems to be some evidence that an increase of Vitamin A in the diet improves the rate of dark adaptation. Other investigators, both in America and in Russia, have studied the relation of dark adaptation to various environmental factors. K. Kekcheyev, N. Derzhavin, and S. Pilipchuk (1943) find that the sensitivity of the already dark-adapted eye can be improved by short, feeble stimulation of any other receptor. Intense or prolonged stim-

ulation has the opposite effect. W. R. Miles (1943) has found that when red goggles are worn, dark adaptation can proceed in a lighted room. This is of course what we should expect from the fact that the red glass absorbs the green rays, those to which the visual purple is most sensitive. The use of red light instead of white for cockpit illumination also serves to protect the pilot's dark-adapted eyes from the blinding effect of green rays. C. P. Seitz and J. Orlansky (1944) have found that visual sensitivity to dim light is about four times greater after viewing a panel illuminated with red light than with white.

About the mechanism of night vision there is general agreement. Concerning color vision, many different theories have been proposed. The three most widely accepted are (1) the Young-Helmholz Theory, (2) the Hering Theory, and (3) the Ladd-Franklin Theory.

Counting physicists, engineers, physiologists, medical men, and psychologists, the Young-Helmholz Theory with its various minor modifications has probably had more adherents than all the other color theories combined. It postulates three fundamental color processes, red, green, and blue (or violet), because all other colors can be matched by mixtures of these. Unfortunately, this theory fails to account for some of the other facts of color vision. For example, it fails to explain why yellow should be visible farther out toward the periphery of the retina than red and green. If yellow were simply a mixture of red and green, it should disappear when they do. Also, it fails to explain why yellow is seen by partially color-blind eyes that cannot distinguish red from green. This fact has been established by the testimony of several persons who were partially color-blind in one eye and could see all colors with the other.

The Hering theory postulates three photochemical substances in the retina, the black-white, the blue-yellow, and the red-green, and assumes that each of these is responsible for two opposite sensations, depending upon whether it is being broken down or built up. According to this theory, when the black-white substance is being built up, a sensation of white or brightness occurs. Every kind of visible light tends to break down the black-white substance to some extent. Hence every colored light has a white component. When the black-white sub-

stance is being built up, a sensation of black results. Yellow light breaks down the blue-yellow substance and in so doing produces a sensation of yellow. Blue light causes the blue-yellow substance to be built up, and this leads to a sensation of blue. Red light disintegrates the red-green substance and green light builds it up. The various intermediate color sensations are due to simultaneous changes occurring in the three different color substances. Thus a blue-green light would break down the black-white substance but build up the other two. A yellow-green light would break down the black-white substance and the blue-yellow substance but would build up the red-green substance. A lavender light or violet light would break down the red-green substance as well as the black-white but would build up the blue-yellow.

The Hering theory further presupposes that even when the eyes are closed, these photosensitive substances are continually undergoing metabolic changes, some molecules being broken down and fresh ones being built up, but that the two processes balance each other, maintaining a state of equilibrium. Now when an external stimulus acts upon them, the equilibrium is upset in one direction or the other, but whenever this happens, an opposing tendency is set up, to restore the equilibrium. For example, if red light falls upon some part of the retina, causing the red-green substance there to be broken down, immediately there is a tendency for rebuilding, resulting in a decrease of the apparent saturation of the red seen. Now, if the subject closes the eyes, the rebuilding of the red-green substance continues, resulting in a sensation of green over the area previously occupied by the red (negative after-image). If a photochemical substance has been built up beyond the normal equilibrium point (as by the action of green light or blue light), then there is a tendency for it to disintegrate spontaneously for a time until the equilibrium point is reached. On the basis of these assumptions, it is possible to account for all the observed phenomena of after-images and adaptation.

The Hering Theory explains partial color blindness on the assumption that the partially color-blind lack the red-green substance. It accounts for retinal zones by assuming that only the black-white substance is distributed throughout the retina, and that the blue-yellow sub-

stance is more widely distributed than the red-green.

One criticism of the Hering Theory is that it assumes that red and green are complementaries. Pure red and pure green are not complementary, but form yellow when mixed. The attempt to get around this difficulty by choosing as "primaries" a bluish red and a bluish green which are actually complementary resulted in forfeiting one of the main advantages of the theory, namely, that its primary hues are those of introspection and common sense.

Because the Hering theory conceives of black and white as antagonistic processes, tending to cancel each other out, this theory has difficulty in accounting for neutral gray. G. E. Müller sought to account for neutral gray by ascribing it to the activity of cells in the cerebral cortex. Hence it is often called "cortical gray." The difficulty with this view is that neutral gray appears very little different from the light grays just above it or the dark grays just below. If its origin is so utterly different, it is hard to conceive how its appearance could be so nearly identical.

The Ladd-Franklin Theory postulates a photochemical substance in the rods and cones which is decomposed by light, giving off different cleavage products in response to radiations of different wave lengths. It assumes that these cleavage products stimulate different nerve endings in the retina, thus setting up nervous impulses which ultimately result in sensations of color. This photochemical substance is thought to have gone through three stages of evolution, each of which is still represented in some part of the normal human eye. At the periphery of the eye, we find the most primitive stage, in which a single big cleavage product is given off in response to any visible light. This product (designated as W) results in a sensation of white or colorless light. Some lower animals have eyes in this stage of development. Somewhat nearer the center of the normal eye is a zone sensitive to blue and yellow. Here the photosensitive substance in the cones is thought to yield two cleavage products, B in response to short waves, giving a sensation of blue, and Y in response to long waves, giving a sensation of yellow. It can be shown experimentally that pure reds and greens falling upon this part of the retina are seen as yellow. A purplish red or a bluish green, on the other

hand, appears in this zone as colorless. This is explained by assuming that when Y and B are both split off they unite chemically to form W, which stimulates the nerve endings for the sensation of white. The complementariness of yellow and blue is explained on the same hypothesis. In the innermost zone, surrounding the fovea, all colors are seen. Here, the Ladd-Franklin theory assumes, the photosensitive substance of the fully developed cones gives off three cleavage products, R for the longest waves, producing a sensation of red, B for the shortest, producing a sensation of blue, and G for those near the middle of the spectrum, producing a sensation of green. When R and G are split off simultaneously, they unite chemically to form Y, giving rise to a sensation of yellow, just as Y and B unite to form W, giving a sensation of white. On the basis of these assumptions, it is possible to account for all the facts of color mixture and complementaries. After-images can be accounted for on the assumption that after a molecule has once started to disintegrate it breaks down completely, giving off those cleavage products not given off at first.

According to the Ladd-Franklin theory, color-blind eyes are atavistic, representing a more primitive stage of evolution. The totally color-blind, who are very rare, represent the earliest stage, in which all visible things appeared white or gray. The dichromats, who are relatively common, represent the stage in which the photosensitive substance yields two cleavage products, B and Y.

The Ladd-Franklin theory interprets black as a sensation arising when no light reaches the corresponding part of the retina at a time when other retinal areas are receiving stimulation.

Each of these color theories and various others that have been proposed from time to time succeeds in accounting for some of the principal facts of color vision but leaves other well-established facts unexplained. Each of them, especially the Helmholtz theory, has inspired much painstaking research; and each by becoming a thesis to be defended has made its most ardent advocates somewhat resistant to new facts not in accord with the favored theory. Here, as in other areas of science, it is perhaps best to take the attitude of multiple hypotheses, recognizing that the facts are not yet all dis-

covered, particularly the biochemical facts, on which the final acceptance of any one of the theories must depend.

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CONCEPT FORMATION.—Concept formation is the process whereby an organism develops a symbolic response—usually, but not necessarily, linguistic—which is made to the members of a class of stimulus patterns, or to an aspect of such a class, but not to other stimuli. When such a generalized symbolic response represents the members of a class of stimulus patterns the organism has formed a class concept (for example, "chair"). When such a response represents an aspect of a class of stimulus patterns the organism has formed an abstract concept (for example, "justice").

Prior to the present century the approach to problems concerning concepts was almost entirely speculative. The philosophers of ancient Greece were deeply interested in the nature of the thing-in-general (the universal, as they called it) and its relations to things-in-particular. Plato held that universals are the original, eternal archetypes of things and that they are realities that are prior to and independent of particulars. Aristotle taught that universals, although not prior to particular things, are realities *in* particular things and that they are more fundamental than particular things. The Stoics and the Epicureans, on the other hand, held that universals are subjective abstractions and that only things-in-particular have real existence.

This ancient controversy continued to find expression in many of the disputes so characteristic of the scholastic philosophers of the middle ages. The question whether universals are real, independent substances was regarded as a matter of great importance by the schoolmen. During the period from the ninth through the thirteenth centuries most of them maintained that an affirmative answer to this question is an essential support of Church doctrine and the philosophical foundation of the Church's intellectual and ecclesiastical structure. During the fourteenth century, however, this view was quite generally discarded even by the most devout schoolmen, and universals came to be regarded not as the essences of things but as "concepts in the mind."

The sixteenth century witnessed a decline of interest in the question as to whether universals are independent substances and an increase of interest in the question as to the sort of material of which concepts are made. Some philosophers concluded that they consist of psychic stuff,

some held that they are purely physical, and others advanced a variety of other theories. The coming of the doctrine of biological evolution and the rise of experimental psychology in the nineteenth century brought a shift in emphasis whereby concepts were increasingly regarded as complex modes of adjustment. Since that time metaphysical questions concerning the ultimate nature and status of concepts have been, in part at least, superseded by an envisagement of concepts in psychological terms.

The rise of the tendency to substitute psychological investigation for metaphysical speculation did not, however, eliminate differences of interpretation of concepts and concept formation. The "schools" of psychology that have been so characteristic a feature of the growth of the young science have by no means agreed in their interpretations. Some psychologists have thought of a concept as a mere group of reflexes which are characterized by a functional consolidation of neural elements. Others have regarded it as "an image functioning in such a way as to suggest a definite meaning, or core of meanings, which the mind attaches equally to all the individuals of a group, or species" (Miller, 12, 192). Many other widely-differing views have been advanced. These differences among psychologists have probably been as great as those among philosophers, but the theories propounded by the psychologists have enjoyed the enormous advantages of being accompanied by, and of being the stimulus for, experimental research.

Psychological experimentation during the nineteenth century was largely concerned with relatively simple processes. Making its appearance at a time when the scientific world was deeply stirred by the idea that complex things and events grow out of relatively simple things and events, experimental psychology quite naturally turned first to problems of a relatively simple character. Since the turn of the present century, however, experimental studies have been made of complex processes such as concept formation, and in recent years a considerable degree of interest along these lines has developed.

A central problem of the earliest experiments on concept formation was that of determining whether there are any images that are generic, i.e., whether an image can stand for a whole

class of objects. Watt (26) and Messer (11) of the Würzburg school conducted investigations that seemed to establish the reality of such images, a conclusion later confirmed by Stevanovic (24). Verbal generalization was employed in the experiments by Watt and Messer; the subject was given a pair of words for which he was asked to state a superordinate. A subsequent study by Gelb and Goldstein (6) showed that generic images do not differ from particular images in clarity or brilliance; the only difference is that generic images are treated as representing classes of objects rather than individual objects.

The study of imagery was also an important part of an early experimental study of concept formation by Fisher (5), an American psychologist who made a thorough investigation of certain aspects of the problem from the point of view of structuralism. Using visual material and an introspective technique, she concluded, among other things, that imagery of both general and particular features of her geometrical nonsense figures tended to become more vague, more attenuated, and less colorful as repetition increased. She also confirmed the result reported by Külpe (10) that in situations wherein abstraction is possible visual features which the subject is not motivated to perceive tend to drop out of experience.

More recent investigations have dealt with a wide variety of problems. The question of the means whereby concepts are formed has received the attention of a number of research workers, practically all of whom hold that analysis of the learning material and grouping are basic to the process. Ach (1) states, first, that under the influence of the determining tendency similars are grouped with similars; second, that the groups are handled by an "idea" that makes possible an economical solution of the task; and third, that in this process differences among the members of the group tend to be averaged out. That trial and error play an important part is generally recognized. The process of concept formation is not necessarily a gradual one, however; at times the learner may manifest insightful behavior and acquire the concept quickly (Smoke, 23). The entire process may be, and frequently is, quite unintentional. Both induction and deduction are usually involved. Manipulation of the object may play an important part (Berkenblit, 2).

Enormous individual differences occur (Humphrey, 9).

Stimulated by the work of Piaget (15, 16, 17), many studies have been made of the growth of concept formation in children. (Four general stages may be recognized in the development of a concept in a child. The first stage is presymbolic, and consists in the fact that the child has learned to react in characteristic ways to a particular object. In the next stage the child employs a symbol, usually a word, that stands for the particular object in question but not for a class of objects. In the third stage the child is capable of implicit responses that are symbolic of the class in question, but he is unable to give a satisfactory verbal formulation of the concept. The final stage is evidenced by the child's ability to give an acceptable definition.) An integral part of this development is the growth of the child's ability to organize objects in groups. Werner (28, 238-240) reports that up to the age of four most children group objects in terms of only one characteristic, usually color or form. A somewhat higher level of development is reached when the child can be shown that the remaining characteristics can be the basis of the creation of sub-groups. Still later he may make these divisions unaided. (Finally, like a normal adult, he may be able to preview his task as a whole and implicitly organize objects into groups in terms of a number of characteristics.)

Sometimes a concept is formed from a group of stimulus patterns all of which are positive instances, i.e., members of the class in question. Much of the time, however, concept formation proceeds on the basis of stimulus patterns some of which are positive instances and some of which are negative instances, i.e., not members of the class in question. (Studies of the effects of these negative instances show that although they "may not make for rapidity in learning they tend to make for accuracy, especially in the case of difficult concepts. It appears that in so far as negative instances assist concept learning they do so largely because of the way in which they prevent the learner from coming to one or more erroneous conclusions while he is still in the midst of the learning process") (Smoke, 22, 588).

Subjects in experiments are frequently able to demonstrate the fact they have formed a given concept by going through a test series

faultlessly, and yet be quite unable to give an accurate verbal formulation of the concept (23). This is true of relatively simple concepts as well as more complex ones. (It is of course recognized that there are some concepts that cannot be defined with exactitude, and that concepts are never static or absolutely complete and final.)

Additional problems typical of those that have been investigated in recent years are these: the relation between a child's concepts as revealed in his drawings and his personality traits (Mott, 13); the hierarchical development of concepts (Welch, 27); the use of tests of concept formation as diagnostic aids in clinical work (Reichard and Rapaport, 18); the formulation of a set of norms for the evaluation of the degree and type of impairment in clinical cases (Reichard, Schneider, and Rapaport, 19); the extent to which children can form the concept of middlelessness without being given verbal cues (Graham, Jackson, Long, and Welch, 7); and the use of Ach's technique, as modified by Sakharov (20), in the study of psychotic patients (Vigotsky, 25).

A number of points of view have been basic to experimentation on concept formation during the past twenty-five years. One of these holds that concept formation consists in finding a "common element" in a group of stimuli. This view has been widely held and has constituted the theoretical basis of numerous experiments. Hull (8) in a well-known investigation regards his subjects as having "evolved" a concept when they discover the "common element" hidden in each member of a group of Chinese characters. Each character in a given group has this "common element" in the sense that it contains "certain strokes in common" with the other characters in its group, and the process of finding these "common elements" is taken to be "the evolution of concepts." Moreover, Hull and others indicate that the "common element" is the concept so far as they are concerned.

This way of viewing concept formation has been criticized by the present writer (23, 2-5) as being an over-simplification in that it deals not with the entire process of concept formation but only with that aspect of it commonly known as abstraction. The processes whereby a young child forms the concept "dog" (Hull's example) are not merely those of locating an

identical "common element" in a group of stimuli. If there are any elements present they are not evolved by the child, for elements are never evolved—they are merely analyzed out. As the child learns more and more about dogs, his concept of "dog" becomes richer, not a closer approximation to some bare "common element." (Concept formation involves synthesis as well as analysis)

(The process of discriminating a type of form has been regarded as concept formation.) Thus, Fields maintains that white rats can develop the concept of triangularity. He writes, "the specific acquired reaction involved in the 'jump to triangle' of the rat will be considered as equivalent to the child's specific language response 'triangle.'" (4, 4). The present writer regards this as another instance of over-simplification. The child's language response "triangle" is symbolic of a class of stimulus patterns, whereas the white rat, although capable of certain types of discrimination and certain generalized habits, gives no evidence of being capable of any comparable symbolic response.

(The process of discovering a principle or rule has been regarded as concept formation.) Ewert and Lambert (3) state that they were studying concept formation when they investigated the process of discovering a principle for the solution of a problem involving the transfer of discs from one circle to another by way of a third. Similarly, Murphy calls an experiment in which the subject attempts to discover a rule "an experiment on the formation of concepts" (14, 388). The present writer regards concepts as indispensable constituents of principles and rules but holds that the identification of concepts with principles and rules is unwarranted and confusing.

The view of concept formation given at the beginning of this article has been the basis of a series of experiments (22, 23). (According to this interpretation the *sine qua non* of concept formation is response to relationships present in each member of a group of stimulus patterns, the stimulus patterns in question being classified as a group by virtue of the fact that they have these relationships, and perhaps certain characteristics, in common. Abstract concepts such as a "justice," "freedom," "integrity," etc., are formed from stimulus patterns that may have only relationships, and one or more aspects of such relationships, in common. Class

concepts such as "chair," "the Stars and Stripes," "mountain," etc., are formed from stimulus patterns that may have not only relationships but also such characteristics as color and size in common. This view of concept formation can be regarded as a point of view for the purposes of experimentation that avoids both metaphysical speculation and commitment to the tenets of any psychological "school."

"The experimental psychologist must have a standard in terms of which he can judge whether his subject has learned a concept. Present knowledge does not make possible the setting up of a biophysical criterion of concept learning, that is to say, it is at present impossible to indicate the neuromuscular and the neuroglandular events that must occur before an individual may be said to have learned a concept. It is entirely possible, however, to set up a biosocial criterion. We propose the following: consistency of differential, generalized, symbolic response" (Smoke, 21, 277, 278). (The standard by which one can judge whether a given individual has formed a given concept is this: the consistency with which he is able to make symbolic responses that differentiate the members of the class of stimulus patterns in question, or an aspect of that class, from other stimuli.)

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CONDITIONED RESPONSE, THE.—

Few phrases occur more often in recent psychological writing than "conditioned reflex" and "conditioned response." It is no accident that these were given their vogue by a physi-

ologist. The actual meaning of the phrases was old and familiar. That new stimuli could evoke a response merely because of association with that response was recognized by Aristotle, Descartes, Hobbes, Hume, Locke, Berkeley,—in fact by practically all writers who dealt with human behavior and conduct. Common sense and popular proverbs have always recognized conditioning.

The reason it took a physiologist to give new life to the notion of association was that association had acquired too many dubious alliances with theological and physiological notions. Most of the literature of association referred to it as "the association of ideas," although it is clear from the illustrations used by the authors mentioned above that they meant to include associative responses as well as associated thoughts.

Only a physiologist who had no concern with the history of the soul or the relation of body to mind or the nature of human will could have given the concept of association so completely fresh a start. The Russian physiologist, Ivan Pavlov, to whom we owe this fresh interest in associative learning, was a student of the physiology of digestion and the digestive secretions. He had been recording the activity of salivary and gastric glands and investigating the occasions for their secretion. At first the intrusion into his results of what appeared to be something psychic rather than physical was only an annoying complication. When his dogs gave signs of responding to irrelevant stimuli like the sight of the experimenter or an adventitious noise simply because this had been associated with the proper physiological cue of food, this confused the situation. He at first referred to the phenomenon as psychic secretion and thought of it in terms of the association of ideas. The sight of food arouses certain ideas of food. Those ideas have been associated with ideas of eating, and ideas of eating have a mysterious "ideo-motor" effect which accounts for the reappearance of the chain of causation as a physical event.

Not being concerned with the mind-body problem, Pavlov searched for the conditions under which this "psychic" secretion appeared. Influenced by the traditional notions of the association of ideas, he found those conditions in the association between the new signal (e.g., bell) and the original stimulus (food), which

latter was presumably the inborn or inherited stimulus for reflex secretion. The psychic secretion appeared to be conditional on an association with the original stimulus. The first English translations of his work established the word "conditioned" and "unconditioned" instead of "conditional" and "unconditional," which would have been more exact translations of the Russian phrases Pavlov used to indicate the new and old stimuli.

Pavlov thought in terms of the physiology of the brain and interprets all of his studies in terms of supposititious brain events. In line with this interpretation, he assumed that the association on which the conditioned reflex obviously depended was an association between certain events in the brain cortex, namely the cortical changes which were the immediate result of sensory impulses from the new and old stimuli. For "ideas" Pavlov had substituted "cortical changes."

This assumption that it is two cortical events occasioned by a new and old stimulus that are associated guided Pavlov's work and has fixed the methods used by the overwhelming majority of psychologists who have worked in the field of the conditioned reflex. In the traditional experiment on conditioning it is these two stimuli that are recorded together with the response used to measure the effect.

Pavlov reported the "psychic secretion" of digestive glands in his book, *The Work of the Digestive Glands*, published in Russian in 1897. This work was brought out in English translation in 1902. In his *Conditioned Reflexes* published by the Oxford University Press in 1927, Pavlov reported a mass of experimental results from work in his own laboratory and the laboratories of his followers.

In a typical experiment the duct of one of the salivary glands is led by a slight operation to discharge to an outer surface of a dog's cheek. The dog is then accustomed to standing in a harness which holds it in place with some freedom of movement, and an apparatus is attached which records the flow of saliva from the duct. Food or acid are used as unconditioned stimuli for glandular secretion. Indifferent stimuli, such as a bell or a touch, which at first do not cause any activity in the gland, are associated with the presentation of food or acid, usually being applied a few seconds before the original stimulus. After a number of pair-

ings of the unconditioned and conditioned stimuli, the conditioned stimuli are found to elicit a flow of saliva in the absence of the original stimuli. Pavlov and his disciples devoted a whole generation of laboratory work to the investigation of the conditions under which a conditioned flow of saliva was elicited or altered.

Outstanding among the generalizations at which Pavlov and his students arrived are the following:

1. Optimum conditioning: (Maximum certainty or strength and minimum practice) occurs when the new signal is given up to five seconds before the unconditioned stimulus.

2. Delayed conditioning: When the conditioned stimulus is begun several seconds or minutes before the unconditioned stimulus, the conditioned response tends to exhibit a corresponding delay after the onset of the signal.

3. Interval between the end of the signal and the onset of the unconditioned stimulus results in a corresponding latent period between the signal and response.

4. No evidence for backward conditioning was found. (This result has been put in question by a number of experiments in other laboratories.)

5. External inhibition: Stimuli other than the signal and the unconditioned stimulus may inhibit the response.

6. Internal inhibition: If the signal is repeated at sufficiently short intervals without the reinforcement of the original stimulus, the response tends to show a decrement. (Later research has established many exceptions to this rule.) From this experimental extinction there is spontaneous recovery. Recovery may also follow interruption by a new, irrelevant stimulus.

7. Internal inhibition: Stimuli which have been repeated without reinforcement tend to become inhibitors of the response.

8. After the establishment of a conditioned stimulus, other stimuli may be found to elicit the response. This was called generalization. Continued practice narrows the range of stimuli which elicit the response to the stimuli which are reinforced in practice. These effects Pavlov interpreted as due to the spread of an excitatory state in the cortex from the projection center of the practiced conditioned stimulus, and, with continued practice, the spread of a corresponding inhibitory state from the same region.

The work of Pavlov has been the inspiration for numerous experiments in Russia, Great Britain, and the United States. The concept of conditioning was promptly welcomed by the American behaviorists with Watson as an example. In the consequent American studies Pavlov's generalizations were adopted in general without change. The time relations between conditioned and unconditioned stimuli were regarded as the critical object of observation and record and few experiments record stimuli other than these or attempted to examine the stimuli accompanying the response. Pavlov's categories of "reinforcement," "internal inhibition," "generalization," "delayed conditioning," were made the subject of investigation.

In applying the concept of conditioning to the problem of learning and habit certain difficulties were encountered. Learning had been studied mainly through the device of the problem box and the maze, situations in which the items of record were time, errors, and goal achievement. A definition of learning in terms of achievement has dominated American and British studies. Learning is defined in terms of improvement in the accomplishment of some end goal,—not as Pavlov conceived it in terms of altered behavior, without reference to purpose or satisfaction.

Since the chief use of theories of learning lies in discovering how best to improve behavior, to acquire skills in effecting results, to economize time and effort in necessary tasks or goal activities, there is a consequent tendency to define learning in terms of achievement and attainment and to disregard behavior changes that are not improving. These are either disregarded or dismissed. By some psychologists Pavlovian conditioning is assumed to account for the acquisition of bad habits or wasteful modes of behavior, while other forms of learning are used to explain success and improvement.

A number of psychologists have attempted to unite the notion of simple associative response or conditioned response, which is formulated without mention of improvement, with the observed generalizations about improvement and goal achievement.

This is done by Hull through a modification of the Pavlovian notion of reinforcement. Pavlov used this merely to indicate trials in which the unconditioned stimulus is repeated, thus

guaranteeing the occurrence of the response. In Hull's terminology, reinforcement is something quite different. It is anything which happens to the animal after the response which serves in some way or other to establish or strengthen the associative connection between conditioned stimulus and conditioned response. With Pavlov it was the mere association between new stimulus and old that was effective in connecting the new stimulus with the response. With Hull and numerous other American writers it is not the fact of association, but a later condition of "reward," "confirmation," or "reinforcement" that operates to make the connection. Using reinforcement as his basic idea rather than association, Hull has formulated by far the most extensive and consistent theory of learning thus far offered, and many of his students have been occupied in laboratory experimentation to test the generalizations consequent to his theory.

Miller and Konorski (1928) and later Skinner (1935) advocate distinguishing two distinct kinds of conditioning, classical conditioning illustrated by the Pavlovian experiment and instrumental conditioning, in which the conditioned effect is related to the outcome of the activity and depends on escape or reward. The distinction is based on the nature of the experiment rather than on the nature of the event. Experiments in instrumental conditioning do not observe or record what the animal was doing when the new signal is presented, which is the basic situation in association.

E. C. Tolman in his *Purposive Behavior in Animals and in Man* has attempted to reconcile the facts that animals and man do achieve goals and improve performance with the notion of association, by suggesting that the items associated are not two stimuli, or a stimulus and a response, but meanings. The bell becomes a signal, not for direct secretion of the salivary gland, but for the desirable end-result of being fed. The bell becomes a signal of food. Or it may become the sign of an injury to come and thus lead to avoidance. Tolman's theory leaves the animal to its own devices as to what to do about these signs of coming good or bad fortune. Elmer Culler, like Tolman, holds that the conditioned stimulus becomes not a signal for the response associated with it, but a signal for anticipating the outcome by performing some appropriate movement. Just what that

movement will be is not indicated by this theory.

Pavlov himself has made little application of his generalizations concerning the conditioned reflex to human or animal behavior. He thought of his experiments as an attack on the problem of brain physiology. Bekhterev, a Russian, published in 1913 his *Objective Psychology* in which the conditioned reflex was made the basis of a whole system of psychology, which he later called Reflexology. In the United States, John B. Watson (1911) and later Stevenson Smith and E. R. Guthrie (1919) used conditioning as the basic principle of theories of learning. Clark Hull, as mentioned above, uses a modification of the notion of conditioning depending on what he calls "reinforcement," as the central postulate of his systematic theory of learning. Numerous writers accept the phenomenon of conditioning as described but believe it to be only an occasional and subordinate phenomenon sometimes occurring in behavior, not as a fundamental description of all learning. Among these are Wolfgang Kohler (1929), E. C. Tolman (1932), and Raymond Wheeler (1929).

An excellent account of current issues in the theory of conditioning is Kenneth W. Spence's chapter on theoretical interpretations of learning published in Moss's *Comparative Psychology*, revised edition, New York, 1942.

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COUNSELING IN STUDENT PERSONNEL WORK.—Although composed of services long performed for the benefit of students, student personnel work is a relatively recent addition to the administration of colleges and universities. It consists largely of those functions usually covered by the terms "admissions," "testing," "counseling," "remediation," "mental hygiene," "health," "financial aid," "discipline" and "student activities." The administrative structure of these functions differs materially from college to college. In some cases, two parallel structures, one for men and one for women, have for many decades presented special problems of coordination. In all colleges, the problems of correlating all functions have presented serious administrative difficulties. Despite these difficulties, however, every college provides at least some rudiment, however inadequate, of all these services for contemporary students.

Restriction in space precludes more than mention of these services. One service, namely, counseling, is one of the basic functions for all students. Other fundamental functions, such as group work, cannot be discussed here. Counseling is chosen for extended discussion because of the current emphasis upon programs which assist the individual to gain insight, orientation and control of his adjustments. Counseling is that phase of student personnel work wherein the student and the counselor together seek to reorder the student's life in such a way as to maximize his adjustments and minimize his maladjustments.

HISTORICAL DEVELOPMENT

Counseling procedures have developed, during the past few decades, out of the current philosophy of individualized education. Through the application of statistical methods and research in various aspects of individual differences, it has become possible to use psy-

chological knowledge and techniques in helping individuals, as opposed to classes and groups, in their personal adjustments and intellectual growth.

In 1909, Parsons proposed a methodology of assisting individuals to select a vocation. Modern techniques of counseling have progressed far from that early beginning and now utilize techniques developed in the Army personnel program during the first world war, and in business and industry during subsequent years. Today counseling techniques draw heavily upon the contributions of psychology in the areas of learning, motivation, emotion, tests and measurements, adolescence, personality and social psychology and also from the fields of education, sociology, mental hygiene, recreation, finance, speech, group work and social case work. Counseling utilizes the knowledge in these areas to bring all available resources to bear upon the adjustment problems of the individual.

In the development of counseling, emphasis originally was placed largely upon the choice of a vocational goal. This emphasis arose chiefly from the concern of students in problems of preparation for their life-work. It was to be expected, therefore, that research in the diagnostic techniques for the measurement of interests and aptitudes progressed more rapidly in these areas than in problems of the measurement of non-vocational interests, social attitudes and other outcomes of general as opposed to vocational and professional education. That problems in the areas of education and vocations were the first to come under a systematic analysis by research methods appears to be largely a result of the sources from which counseling originated—education, the Army, business and industry—and the dominant elements in the philosophy of higher education current in public universities. Profound shifts from this early preoccupation with problems of vocational choice and adjustment are already influencing the counseling movement in colleges and universities.

THE STRUCTURE AND CONTENT OF THE COUNSELING PROCESS

Counseling may be schematically outlined in the following major steps: *analysis* or collecting adequate and relevant data about the student; *synthesis* or summarizing data to high-

light the significant facts and meanings of facts involved in the student's adjustments; *diagnosis* or identifying the "causes" of the student's adjustment problems; *prognosis* or predicting the future development of the adjustment and the outcomes of counseling; *counseling or therapy* or the cooperation of counselor and student to resolve problems and to turn the problem situations into adequate adjustments; and *follow-up* or the determination of outcomes of counseling, the adequacy of subsequent adjustment and the nature and results of subsequent developments experienced by the student.

ANALYSIS

In the making of an individual analysis of a student's adjustment problems, the counselor utilizes the case study. In counseling, the case study consists of procedures used in *collecting*, *recording*, and *analyzing* significant and relevant information about an individual. It includes data reported from associates, tests and other measuring devices and interviews.

Reports from faculty members, parents and others associated with the student and concerned with the detailed facts about and evaluations of his adjustments are collected in various ways. One of the more reliable methods of obtaining such information is that of anecdotal reports. The counselor usually integrates and cross-checks such information to eliminate bias or to discover whether the person reporting has adequate opportunity to observe the student in situations relevant to the adjustment problems being studied or analyzed.

A most important tool in the analyzing of students in the case study is the *psychological test*. There is a vast amount of literature about tests, and a counselor is expected to be well-grounded in the research literature about the major measuring instruments. A test is usually chosen for use in counseling students on the bases of the purpose for which it was constructed, the suitability of the norm group in relation to the student client being counseled and its standardization and reliability. It is desirable that colleges establish local test norms because of the wide variation among colleges in terms of the distribution of the scores of student populations. For example, research on the use of the American Council on Education Psychological Examination has demonstrated

that the median raw scores of student populations can be arranged in an hierarchial order and that there will also be little if any overlapping between the distributions of students' scores in colleges at opposite extremes of the hierarchy. While national norms may be useful in identifying the relative position of a college population, it is more important in counseling individual students for each college to use its own typical norms which are revised periodically.

Adequate tests are available for the measurement of scholastic aptitude and scholastic achievement in the various subject-matter fields, a limited number of aptitudes, certain personality dimensions and a few of the many observed attitudes. Personality tests at present do not have as high reliability and validity coefficients as have tests of achievement. In the use of personality tests, counselors *sometimes* find it valuable to inspect responses to individual items for additional information about the student's adjustment.

Some useful information about individuals may be gained from use of other analytical methods. *Self-ratings* and reports usually consist of personality inventories, autobiographies, personal history and time-distribution records. While such data require objective verification by the counselor from other sources, they are none-the-less real insofar as they reflect the psychological self-orientation of the student regardless of the objective reality of the reported data. A comparison of the subjective report derived through inventory or autobiography, with the objective reality of a stated fact about the student may illuminate the case in such a way that the counselor's orientation—or even his function—may change radically. This is especially true if the student is psychotic or psychopathic. Hence the necessity for verifying the student's report about himself by means of observations and reports from other sources.

Another important, perhaps the most important, technique useful in the case study of an individual is the *personal interview* between the student and the counselor. The interview has been described as having three different functions in counseling: research, diagnosis and treatment or therapy. Although much research remains to be done on the processes and dynamics of the inter-personal relationships in the counseling interview, there is nevertheless

a substantial amount of experimental and experiential literature for use in training the counselor.

Since it is generally agreed that an effective counseling relation cannot be achieved without *rapport*, the interviewer first attempts to put the student at ease and to create an atmosphere which instills confidence and relaxation in the student so that he can discuss his problems without emotional blockings and with the casualness and confidence existing in a conference between two friends of mutual trust. The counselor notes carefully the leads and the meanings, both implicit and explicit, in the verbalization, gestures and inflections of the client. The student's expressive movements are carefully observed because they may provide cues by means of which the counselor may judge other reactions. Furthermore, these cues may indicate reactions which are out of proportion to the problem under discussion and, therefore, stimulate the clinician to look beyond the situation of immediate adjustment to more basic mechanisms involved in the individual's adjustments.

Expressions of surprise or moral judgment by the counselor, in response to statements made by the students, have been found to be not only ineffective but also damaging to *rapport* and therapy. Students would probably not need counseling services if such moralizing or disapproval had been effective as used by non-counselors upon previous occasions. Such responses may be particularly devastating to counseling if the client has emotional problems related to parental, disciplinary or religious conflicts. A counselor, therefore, should accept the individual student with his attitudes and beliefs, spoken or implied. Any attempt to change these characteristics of the student must be skillful and subtle; they require willing cooperation from the student.

The *structuring of the counseling interview* varies with the student and with the nature of the adjustment problem. Often the student is allowed to structure the situation and in such cases further developments depend upon the direction taken, the type of treatment necessary and the most effective and economical means involved in achieving the student's goal. The basis for this conclusion may be found in research which indicates that more ideas are expressed, and expressed more adequately, if

the subject is permitted to tell his story freely and later questioned by the counselor to fill in any gaps in details. Studies in the form of questions best used in interviewing show that the implicative (or leading) is the most unsafe form to use. The question which uses neither a negative nor a definite article is apparently the most reliable.

The interviewer occasionally checks his judgments to see whether the "halo effect" is operating in his judgments about the student's personal qualities. This and other forms of bias have been shown to operate so effectively as to secure diametrically opposite results when bias is not controlled in judgment-making by the counselor. Since investigations have shown that half of the reasons given for a judgment of a personality trait were found to be non-specific, the interviewer should constantly guard against making judgments if he has no clear understanding of the factors associated with his judgments.

With respect to the student in the interview situation, the counselor should, upon appropriate occasions, skillfully guide him to observance of the main purposes of the interview, except in such instances as certain types of emotional therapy wherein free association may be desirable. There are other ways in which the student can contribute to confusion or to dispersion of effort, as, for instance, by observing expressions of the counselor with consequent modifications of his behavior in accordance with his interpretation of the counselor's meanings. This may be particularly important to counseling when the student is upset or unstable and when he is seeking a state of dependency.

Since the most common errors of memory have been found to be those of omission rather than those of accuracy, the student's story given in the interview requires further elaboration through questioning and often through verifications from outside sources. Experience reveals that excitement and affective tone tend to improve observation and memory somewhat but, if they are excessive, the reverse occurs. In the interview the counselor faces not only the problem of understanding the student and guiding the interviewing process effectively but also that of evaluating the reports obtained from the student. Interviewing is most likely to be useful in securing information not obtainable from other more objective sources.

SYNTHESIS

In this next step in counseling, the student and the counselor summarize the data already collected. At this point, the data identify the student as an individual differing from others in potentialities, aptitudes, disabilities, hopes, fears and other characteristics. An example of synthesis of objective case data is found in the psychological test profile which summarizes and high-lights the salient facts about the student's measured knowledge, aptitudes, interests and personality traits.

DIAGNOSIS

After examining all the data for accuracy, completeness and relevancy, the student and the counselor may formulate an hypothesis concerning the problem of the student. Both may make revisions of this hypothesis as the counseling proceeds. The manner in which assets and liabilities function in the dynamics of life adjustment serves to orient the student and the counselor so that the diagnosis is not oversimplified and so that the counselor may predict future behavior and, in cooperation with the student, determine treatment procedures. In both diagnosis and treatment, the clinician may use not only objective data but also insight, subliminal cues, intuitional and clinical background just as the student uses the same methods to understand himself.

Several methods have been suggested for validating diagnoses. Allport has recommended the method of congruence in which the "systematic relevance" of incidents is sought in order to determine whether the hypothesis is valid in terms of the personality structure of the individual. A good test of validity of a diagnosis may be the student's tryout of a proposed remedy. This, however, complicates the problem of validating a diagnosis by introducing the concomitant problem of validating the treatment or therapy procedures.

PROGNOSIS

For an individual case, a prediction should be made, when possible, on the basis of actuarial statistics or experience expectancy of students with similar abilities, aptitudes and interests, and from the individual qualities of the student which may make him more or less likely to overcome his particular handicaps. To facilitate

prognosis in the field of vocational and educational guidance, occupational-ability profiles and education-ability profiles have been constructed against which the individual student's profile may be projected. Probability studies in other types of adjustments are not as well advanced and accurate. From the standpoint of prognosis, it is essential in all types of adjustments that deficiencies be understood by the student. Disabilities in the areas of reading, speech and social skills frequently must be corrected before adjustments to other problems can be achieved. Furthermore, such factors materially reduce or increase the likelihood of a student's adjustment and thereby influence his efforts to adjust.

In probability studies of prediction in the area of scholastic achievement, results show that a very small per cent of those students whose average high-school scholastic rank and test percentile rank fall in the lowest quartile of college freshmen make a satisfactory college record. Other studies have shown that more accurate predictions can be made about the prognosis of failure for low-ability students than for those with high college aptitude test scores. High-school grades expressed as a rank in the graduating class is usually the best single predictor of college success as measured by grades—the two correlating approximately at .55. Achievement test and college ability tests correlate with college grades to the extent of approximately .50 and .40, respectively.

Prediction studies of success in schools of law, medicine, engineering, nursing, dentistry and business, based on a battery of special aptitude tests, yield somewhat similar correlations. Since correlations above .70 are very seldom achieved between test batteries and scholastic success, an individual prediction for a particular student has a large standard error of estimate. Horst and his associates have discussed the literature on the prediction of personal adjustment (2).

COUNSELING OR THERAPY

It is in treatment or counseling that the organization and coordination of a student personnel program show to great advantage. The programs of other campus personnel agencies dealing with finance, housing, religious participation and other aspects of student life may be enlisted and exploited for the welfare of the individual. A free inter-referral system makes

the transitional contacts easy for the student except in certain types of emotional maladjustments.

The major approaches to this step in the structure of counseling are: remedial, as in the case of speech, reading or health problems; reorienting the individual, as in the case of certain types of attitude problems; changing the environment, as in securing changes in course regulations and requirements or changing jobs; and giving the individual necessary information which he may lack. All of these approaches may make extensive use of other campus personnel agencies. Counselors endeavor to enlist the cooperation of parents whenever feasible.

Remedial treatment in speech or reading may consist of referral to experts who retrain the client while the counselor continues to see him about other adjustment problems. Students who lack social skills, social contacts or social outlets may be referred to the student activities division for specific help in learning to participate as citizens of the college community. Students with severe personal or family conflicts may be referred to a mental hygienist. Students with financial problems may be referred for loans or scholarships or for employment counseling regarding suitable part-time work.

Reorienting the student may constitute a relatively long and difficult counseling job. For example, downgrading a student's ambition—or, frequently, his family's ambitions—may require many interviews with the client and with one or more members of his family. Assisting an individual to solve an emotional problem calls upon all the skill and background which the counselor has readily available. Catharsis, persuasion, suggestion, emotional re-education, habit retraining and information giving are the techniques generally adaptable to the counsellee. Rogers has recently discussed an adaptation of Rank's "relationship therapy" in connection with the counseling of those students having certain types of emotional problems (3). He says the client needs acceptance in a permissive environment; through talking about his difficulties, he evolves his own solution without being directed toward any solution by the counselor.

Changing certain features or all of the environment may consist in arranging, or having the student arrange, changes in employment, in instructors, in housing or in scope and type of

socializing activities. In the case of exceptional students, it may consist in having requirements waived to cut through a mass of red tape. This type of treatment, often relatively easy, may have sudden and spectacular results in certain counseling situations.

Many students who are thought to have "problems" may be better characterized as not possessing adequate information to achieve adjustment. In such counseling cases, information may be given or the student may be told where he can obtain it. Usually the student is required to take positive steps such as this in order that he may realize he should cooperate in solving his problems and in learning to make decisions independently. The process of re-educating some overly-dependent students is tedious and involved; in other cases, counseling consists of direct, casual and friendly assistance. *The treatment techniques should be adapted to the nature of the adjustment problems and the personality of the student. There is no universal, standard counseling technique or ritual which will prove effective in all types of situations with all types of students.*

FOLLOW-UP

Since adjustment is a continuous process throughout an individual's life span, a follow-up or verification of the counseling outcomes is important for several reasons. First the counselor desires to know whether the student has successfully solved the problem or problems which motivated him to seek assistance. In addition to this the counselor attempts to discover whether the student has incorporated into his behavioral pattern more appropriate techniques for solving new problems which subsequently may have arisen. Furthermore, follow-up work is not only an integral part of the total counseling process, but it also serves as the stepping-stone to a general evaluation of the adequacy of diagnostic and treatment techniques.

There are two general types of follow-up case work. Through the use of a tickler file, both student and counselor may be reminded of appointments. This is especially desirable when a long series of interviews seems appropriate or when interviews are either irregularly or widely spaced in time. Such a method permits the counselor to review the case notes before the contact and to plan the content and direction of the interview as far as his participation

is concerned. A second type of follow-up consists of a periodic re-reading of all case records to determine those cases which remain uncompleted. Students who have not exploited counseling contacts may thus be identified. Interviews may be arranged for the purpose of evaluating progress and continuing the counseling if the student desires to do so.

EVALUATION OF COUNSELING

Because of the complex and highly individualized nature of counseling, and because of the difficulty in defining adequate criteria by which the success of counseling may be judged, the results of most evaluative studies in this aspect of student personnel work have not been of crucial importance. In many studies only one criterion, such as grades, graduation or "success" on the job, has been used to gauge the effectiveness of counseling. Certain limitations inhere in such criteria; for example, low-ability students who achieve insight through counseling and withdraw from college to seek either training at a more appropriate level or suitable employment may be judged to have adjusted very adequately, but, in such cases, this adjustment cannot be estimated by such criteria as grades or graduation from college. Furthermore, grades are not equally meaningful for all "bright" students. Even job success is difficult to estimate, let alone measure, because of local conditions on the job, social and economic conditions which obtain at a given time and the unreliability of employers' ratings. Although research methods are improving in experimental design and in scope, the results of evaluative studies should be considered as tentative. Few of these investigations have studied counseling outcomes in relation to later life and occupational adjustments.

Research studies have consistently shown that students select more appropriate occupational goals after being counseled. In these studies, the choices of students tend very definitely to become more realistic and more suitable to each individual's basic measured potentialities. However, there is some evidence indicating that students planning to enter the professions but lacking the requisite abilities are more reluctant to change vocational goals than those planning to enter sub-professional fields.

British follow-up studies, carried out over a long period of time, show a consistent trend

toward more adequate on-the-job adjustment on the part of those individuals who followed counselors' recommendations based upon an analysis of aptitudes. These studies also show a significantly larger number of subsequent changes in employment to recommended vocational areas by students who originally rejected counselors' suggestions.

Concerning educational improvements, controlled studies have shown that a large majority of counseled students improve scholastic adjustments as indicated by grades in college courses. This fact seems clear both when students' grades before and after counseling are compared and when the grades of counseled students are compared to those of non-counseled students with comparable types and amounts of scholastic aptitudes.

In the area of social adjustments, studies are relatively few and criteria are even less satisfactory than those for vocational and educational adjustments. Exploratory research has indicated that a group of students counseled individually and systematically in college activity participation tends to achieve significantly better social adjustment, as measured by performance on a personality scale, than a comparable group left to its own devices.

Taken as a whole, research studies in the evaluation of counseling outcomes demonstrate that there are significant, measurable differences favoring counseled students when they are compared to non-counseled students of similar potentialities. Research is needed concerning other possible personality differences between these groups. Preliminary research, indicating that counseled students participate satisfactorily in more aspects of campus life than do students who have not sought or received counseling, may provide the framework for investigating and evaluating more comprehensively the role of counseling in a student personnel program.

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CREATIVE THINKING. — (Creative thinking is the type of thought which is best illustrated in the production of a work of art or the solving of a scientific problem. It is characterized by the four stages of preparation, incubation, illumination or "inspiration," and elaboration or verification.) Helmholtz (17) described the first three periods and Poincaré (44) added a description of the fourth. Wallas (57) has clarified the descriptions of Helmholtz (17) and Poincaré (44) by giving definite names to the stages of thought which they distinguished. (Creative thought is differentiated from the type of imaginative activity found in reverie or day-dreaming in that it is directed by a purpose or goal. Reasoning by special disciplines and techniques plays an important part in the process, especially in the first and last stages.)

The first period of creative thinking is preparation, when the subject is assembling or receiving new ideas (38, 39, 40). During this time the ideas shift rapidly. One's thoughts are not yet dominated by any coherent theme or formulation. A scientist starts to solve a problem and considers its various phases. An artist receives various impressions from what he sees, as a landscape for instance, or from what he hears or reads. The period may be longer for the mathematician, who spends some time laboring over a problem, or for the writer of a historical novel, who collects much factual information, than for the poet, who often receives his impressions in a short time. (Preparation is a time when the creative thinker is receiving or gathering his raw material. It may last from a few minutes to months or years.)

(Incubation is the stage which follows preparation, although it may accompany it. Incuba-

tion is a period in which the problem is laid aside and no voluntary work done upon it, but after this time renewed attention to the problem results in a prompt solution or at least a prompt advance beyond the previous degree of mastery.) (A mood or idea is being incubated when it involuntarily repeats itself with more or less modification during a period when the subject is also thinking of other topics. It may be indefinitely related to an ultimate goal, as a poet while incubating a mood may have the ultimate goal of writing a poem about it later, or a mathematician may think of one aspect of a problem with the ultimate goal of solving it. As soon as the mood or idea becomes definitely related to a specific goal, we have the third stage of illumination or inspiration.) For instance, a poet may be incubating a mood of stillness. All at once it becomes definitely related to the specific goal of rhythmic lines, and then we have the third stage of illumination. Or a mathematician may be incubating one aspect of a problem and then all at once this aspect becomes definitely related to the specific goal of the correct formula and we have illumination. The scientist usually incubates an idea while the poet or artist more often incubates a mood or emotionally toned experience. When we compare the incubation which occurs in the writing of a poem, the painting of a picture, the making of an invention, and the solving of a problem, we find that there are certain characteristics common to this stage of thought. In the first place, no active work is done on the idea or mood that is incubated. The subject thinks of other topics. In the second place, the idea or mood that is incubated recurs spontaneously. In the third place, the idea or mood is more clearly defined at the end of the stage than it was at the beginning, for it has been modified. The length of the period of incubation varies from person to person, and also within the same individual from time to time. The length of the stage ranges from hours or days to months or years. But the generalization cannot be made that it will always last a certain time for a certain person, for under one set of circumstances the period may be only a matter of minutes or hours and under other conditions it may last months or years. It is not surprising that there is such variation in the length of the period of incubation, for there are various factors which influence it. Some of these

would be the nature of the original stimulating situation, the intensity of the emotional reaction set up, and the daily life of the individual, not to mention numerous other factors.

The third stage is that of illumination. It occurs when the idea, which has been incubating, becomes definitely related to a specific goal. It is the period when a poem is composed, or the general solution is achieved. In this period the essential structure is completed. A part of a poem seems to come automatically and spontaneously by itself. Or in the case of a mathematician a new relation to a problem comes all at once. An emotional reaction does not necessarily accompany this period, although it generally does. Rossman (50) and Platt and Baker (43) have shown that the solution to a problem with scientists or inventors is apt to occur at some odd moment when the problem has been laid aside after intensive work upon it. The successful hunch would come suddenly as a flash of insight and is usually of short duration. Blanshard (5) speaks of the "leap of suggestion," Christof (10) of the solution of a problem after an accumulation of psychological products or food for thought, and Portnoy (45) of the third stage in which the artist works with abundant energy.

Elaboration or verification is the final stage. For both the artist or the scientist the idea which is obtained in illumination is elaborated and revised during the last stage of verification. The length of the period may vary from a few minutes to months or years. It may be very slight as in the case of a lyric poem, for instance, or comprise much calculation and checking, as in the case of mathematics.

Although these four stages can be distinguished in the thought process, yet it must be remembered that they may overlap. Incubation often occurs along with preparation, and revision may begin during the period of illumination. In the stage of preparation, while the subject is still receiving new ideas, one mood or idea may be incubated and recur from time to time. Also revision of the lines may start before they are completely formulated.

Creative thought is frequently accompanied by an emotional reaction, although this is not always the case. Hutchinson (19, 20, 21) says that the period of preparation is composed of trial and error activity, false starts on the basis of inadequate hypotheses, random effort, stereo-

typed errors, real, vivid and undermining frustration. In the second stage of incubation (or renunciation) the problem is given up and other activities are interpolated. There may be rising emotional tone and restlessness with a feeling of inferiority. Following incubation is the third stage of illumination, in which an artist often experiences an intense emotional reaction with the corresponding bodily changes, or works in a feverish state as Galli (14) mentions. Others have it to a much less degree or scarcely at all. Likewise in scientific thinking the period of illumination is accompanied by an emotional reaction in many cases. There is a feeling of exultation, adequacy, and finality. Bahle (1) notes that the sudden idea is characterized by its fitness for the problem at hand, feeling of unfamiliarity, capacity for expansion, and its vitality, freshness, and originality. The thinker may feel that the inspiration has come from sources outside of himself because he does not understand the psychological stages of preparation and incubation which have preceded his creative illumination, and he may underestimate his own ability (53). In the final stage of elaboration or revision the attitude has changed from the creative one to the critical attitude. There is the dominance of negative standards of criticism over positive ones.

According to Poincaré (44), Lowes (33), Downey (13), Jastrow (43), Portnoy (45), Prescott (16) and Ribot (48) incubation is a period of work by the subconscious mind. It continues to work when conscious effort has been suspended and is the basis of the ideas of illumination or inspiration. Another explanation of incubation is that no such work is done by the subconscious mind during the resting period, but that interferences and false leads, emphases, and assumptions are given a chance to fade out through forgetting, so that certain relations and possibilities which are invisible to the subject in the active preparation period come into view after a rest. Helmholtz (17) said that the modifications during the period of incubation were due to the overcoming of fatigue and the handling of material in a better manner. Ruger (51) and Meinicke (37) have studied the differences in mental set at the time of discovery. Woodworth (60) states that since the problem does consciously recur from time to time during the period of incubation,

though without effortful work done upon it, partial solutions may be obtained. If illumination comes in a period of intense concentration on the problem, the assumption of previous unconscious work is gratuitous. The freshness or lack of brain fatigue which appears to be necessary for illumination may furnish a sufficient explanation. The thinker may fall into certain assumptions from which he cannot escape as he may on returning to a problem after a rest. Rignano (49) asserts likewise that normal reasoning is produced almost entirely in the conscious state and that unconscious elaboration does not take place at all, since the supposed unconscious elaboration is not in the least fatiguing.

The Gestalt investigations have mentioned the primacy of the whole over the parts. In a study of poetic and artistic creative thought the primacy of the whole over the part was frequently apparent throughout the process from the beginning (41), but in other cases the idea of the whole developed from a detail or part during incubation; which idea of the whole in turn preceded the parts or details brought out in the stage of elaboration.

Creative thought is to be distinguished from other types of imaginative activity, as in phantasy, reverie, or daydreaming, in that it is directed by a purpose or goal. Burt (8) and Prescott (46) have stated that purpose controls the resulting mental activity until the problem is either solved or else given up on account of its difficulty. Such controlled imaginative activity results in the formation of new ideas or solutions. In the integration of the process of reasoning Pillsbury (42) has emphasized the importance of purpose, and Maier (35) has described the direction of goal or end.

The activity of the imagination which results in the construction of new ideas from past experiences has been variously described. The fusion of images or elements of past experience into new combinations has been indicated by Pillsbury (42) when he says that inference or deriving a conclusion always depends on the laws of association. Ribot (48) asserts that creative imagination is due to the property of images to gather in new combinations. Reasoning is the flow of ideas determined by the laws of association according to Binet (4) and Pyle (47). Thorndike (56) writes that reasoning shows the action of the simple general laws of

connecting in cases where the connections are with the elements of the situation rather than with the gross totals, and where the connections compete and cooperate in complicated organizations. Hollingworth (18) speaks of reintegration in reflective thought and of the importance of cues in reintegrating a consequent event or in mere associative reproduction. Sargent (52) describes imagination as the forming of new combinations or patterns out of past experiences, resulting in an original product. According to Wertheimer (58), Wheeler (59), and Koffka (23) an act of invention is the completion of a pattern or configuration which was previously recognized as being incomplete. Reasoning is the reorganization of isolated experiences in terms of a goal. Creative thinking is the successful transposition of a member of one configuration to another, according to Wertheimer (58).

Conditions which favor creative thought are that the time should not be too strictly limited for the thinker, and the problem should be sufficiently difficult. Illumination often appears after the problem has been laid aside for a while and the thinker is engaged in other activities. Rossman (50), Harding (15), Boraas (6), Carr (9), and Platt and Baker (43) assert that conditions as half-asleep, light physical exercise, or the pursuit of activities different from those connected with the problem are important. Periods of idleness in which autistic thinking may promote imaginative ideas are justified according to Britt (7). Ribot (48) asserts that one must first possess the spirit of observation and wide-awake attention which isolates and fixates accident, and Boraas mentions the importance of optimism (6). Tartman (16) suggests that creative thought is aided by relaxing the pressure of ordinary routine to allow more free time and also by making close imitative study of good models.

Lehman (24-32) has shown that in nearly every line of endeavor the majority of the best work is produced between the ages of thirty and forty years. This is true in those lines of work where individual achievement is the primary factor, but it is not so evident in those occupations where other social conditions are important for achievement. In music, drama, art paintings, literature, etchings, chemistry, mathematics, physics, medicine and related fields, inventions, and philosophy the majority of the

best work is produced between thirty and forty years of age. In the case of astronomers and architects the peak is between forty and fifty years. In other fields, where social factors besides individual achievement are important, the best work is more often produced at later ages, as military leaders in the late forties, political leaders in the late fifties, large incomes in the late fifties and sixties. The fact that in almost all the various lines of endeavor, where individual achievement is the most important factor, the peak of production of the highest quality is within a narrow age range between thirty and forty years is evidence that creative thought is of the same essential nature in the different fields. Spearman (54) states that in creative thought the form of mental process involved in creation is everywhere the same; it is always the transplanting of an old relation, and in consequence the generating of a new correlate. Wallas (57), Hutchinson (20), and Lowes (33) likewise assert that creative thought is essentially the same in the different fields of endeavor.

Among other terms which have been used to describe the psychological stages of creative thought, Luzzatto distinguishes three moments, as he calls them, in artistic creation (34). The first is the simplification of reality in the active enjoyment of a natural spectacle or manifestation of human life. This corresponds to the first two stages of preparation and incubation. The second moment is when the simplification of reality is transferred into communicable form which corresponds to the third stage of illumination. Elaboration or verification is the same as his final stage of execution. Similarly, Ribot's (48) first phase corresponds to the stages of preparation and incubation; his second phase to that of illumination; and his third phase to that of elaboration or verification.

James (22) writes that the art of the reasoner consists of two stages: sagacity or the ability to discover what part of the abstract property lies embedded in the original data, and learning or the ability to recall promptly the consequences or implications of the abstract property's consequences. Duncker (36) speaks of analysis of problem, analysis of materials, analysis of goal, solution by resonance, and insight in reasoning. Steps of thought mentioned by Claparede (11) are perception, perusal, inference, and groping one's way or trial and error.

The logical order of steps in reasoning has been brought out by Dewey (12). He speaks of a felt difficulty; its location and definition; the suggestion of a possible solution; the development by reasoning of the bearings of the suggestion; further observation and experiment leading to acceptance or rejection. Billings (3) and Symonds (55) have postulated five somewhat similar steps. Bentley (2), Blanshard (5), and Christof (10) speak in a more or less similar manner of three steps of thought as formulation of task, elaboration, and solution. Scientific descriptions of logical steps of reasoning are not the same as those of the psychological stages of creative thought. For instance, descriptions of logical steps of reasoning do not bring out the need of rest before illumination or the time order of the different stages. The five steps mentioned by Dewey, for example, might all occur in the first stage of preparation, in which the thinker may get an idea, pursue it slightly, and reject it.

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E

EAR, THE.—The organ of hearing is conveniently divided into three parts, i.e.; (1) the external ear, which consists of the auricle and the external auditory canal; (2) the middle ear, including the tympanic membrane, the eustachian tube, the tympanic cavity, the antrum and the mastoid cells and (3) the internal ear, consisting of the osseous labyrinth, the membranous labyrinth and the auditory nerve.

THE EXTERNAL EAR

The *Auricle* is composed of scroll-like folds of cartilage covered by skin. The posterior curved rim is called the helix, and anterior to this rim and extending along its entire length is a Y-shaped elevation, the antihelix. The limbs or crurae of the Y enclose a shallow depression, the fossa triangularis, while the stem curves down and forward to terminate in a small oval elevation, the antitragus. Anterior to the antihelix and with a shorter radius of curvature is found a semicircular depression, the cymba conchae. The cymba is bridged a little above its center by the crus helicis, which fans out anteriorly and below it funnels down to end in the external auditory meatus, which opens into the external auditory canal. In front of the meatus a convex leaf of cartilage, the tragus, is so situated to partly form a protective covering to the opening. The helix terminates below in a soft pad of tissue containing no cartilage and is called the lobulus. It is thus seen that the structure of the auricle, with its concentric folds of cartilage funneling down and into the external auditory meatus, is well adapted to collecting and directing sound waves to reach the inner structures of the ear.

The *External Auditory Canal* is directed inward and slightly forward for a distance of about 36 mm to end at the tympanic membrane. Its first portion is composed of cartilage which changes to bone as the tympanum is approached. It is lined by closely adherent cutis which contains sebaceous glands and hair follicles along the cartilaginous portion of the

canal whose anterior wall is crossed by two or three fissures (fissures of Santorini) containing a few muscle fibers and connective tissue which serve to render the auricle more moveable. The canal conducts sound waves which have been collected and directed by the auricle to the tympanic membrane. Sound waves thus canalized are amplified by the structures of the external ear which prepare them for transmission and perception.

THE MIDDLE EAR

The *Tympanic Membrane* closes the external auditory canal, being attached to a groove (sulcus) in the annulus and pitched at about a forty-five degree angle inclining downward in both vertical and horizontal planes. The membrane is oval in shape, about 9 mm in diameter and 0.1 mm thick. It is composed of an outer layer of cutis reflected from the canal, a middle layer of inelastic radial and circular fibrous tissue mats and an inner layer of reflected mucous membrane from the cavity of the middle ear. The handle of the malleus is imbedded within the structure of the membrane. The upper portion of the membrane which is attached to the Rivinian segment (where the annulus tympanicus is absent) does not possess a middle fibrous layer and is known as Shrapnell's membrane, pars flaccida or membrana flaccida in distinction to the less elastic remainder of the drum, membrana tensa. As viewed through an otoscope the tympanic membrane appears as a delicate translucent curtain possessing a pearly sheen which is slightly moveable when a column of air is directed against it. Shrapnell's membrane is limited below by the posterior fold, the circular protruding short process of the malleus and the short anterior fold. The handle of the malleus appears extending downward and backward from the short process to end in the slightly invaginated center of the drum (umbo) from which a cone of reflected light is observed extending downward and slightly forward towards the rim.

Sound waves reaching the tympanic membrane cause it to vibrate in a manner roughly similar to the open palm tattoo which vibrates the head of a Cuban drum.

The Eustachean Tube extends from the tympanic cavity to the nasopharynx a distance of about 36 mm. The tympanic portion is osseous and the pharyngeal section (24 mm) is membrano-cartilaginous. The tube has flaring orifices at ends and a narrow constriction (isthmus) where the osseous section joins the cartilage. The canal of the tensor tympani muscle lies above and the canal for the internal carotid artery lies internal to the osseous portion of the tube. The cartilaginous section is lined with ciliated columnar mucous membrane which sweeps the secretions towards the pharyngeal orifice in the same manner that the para-nasal sinuses are normally evacuated. Normally the eustachean tube is collapsed and opens only during the acts of swallowing and yawning when the palatal muscles are contracted. Air may be forced in the tube by forcibly blowing the nose against a nasal obstruction or sneezing when nasal obstruction exists. The levator palati, the tensor palati and the salpingo-pharyngeus are the muscles which act upon the tube. The function of the eustachean tube is to equalize air pressure on each side of the tympanic membrane. By the ciliary action of the lining mucous membrane effete material is prevented from entering the middle ear through the pharyngeal orifice and inflammatory exudate is removed from the cavity of the middle ear when it is diseased.

The Tympanic Cavity is bounded above by a thin plate of bone separating it from the middle fossa of the skull frequently containing dehiscences through which the dura may come in contact with the mucous membrane and below by a thin plate of diploic bone in close proximity to the jugular bulb and the carotid artery. Externally the cavity is bounded by the tympanic membrane and small portions of the temporal bone, while the anterior wall contains the opening of the eustachean tube and the canal for the tensor tympani muscle, and below the inferior edge of the opening of the eustachean tube the wall is in close relation to the canal for the internal carotid artery. The posterior wall of the tympanic cavity presents the opening to the mastoid antrum (aditus), beneath which is the pyramidal process within which the stapedius muscle is located. The inner

wall of the cavity forms the outer wall of the labyrinth and contains the oval window (fenestra vestibuli) closed by the foot plate of the stapes, the round window (fenestra cochlea), a projection formed by the basal turn of the cochlea (promontorium), a prominence formed by the facial canal (facial ridge) and the prominence of the lateral semicircular canal. The mucous membrane lining the tympanic cavity and its adnexae consists of flat nonciliated cells except along the gutters of the drainage channels where it changes to the ciliated columnar type. The tympanic cavity is conveniently divided into three parts, i.e.: (1) the epitympanic space (attic) lying above the level of the upper margin of the membrana tensa, (2) the atrium situated between the levels of the upper and lower margins of the membrana tensa and (3) the hypotympanic space which is located below the level of the tympanic membrane.

The tympanic cavity contains three small bones, the ossicles, supported and bound together by five ligaments and forming a chain connecting the tympanic membrane with the oval window of the labyrinth. The ossicles named in their order from the tympanic membrane are, the largest malleus (mallet), the smaller incus (anvil) and the smallest stapes (stirrup). The stapedius muscle arises from the interior and posterior tympanic walls and is inserted in the neck of the stapes so that its contraction tilts the anterior end of the footplate outward, the posterior portion of the membrane of the oval window acting as a fulcrum, the power being applied at the head of the stapes. The tensor tympani muscle arises above the osseous portion of the eustachean canal and from the upper wall of the cartilaginous section of the tube, passes upward and backward within its canal to emerge in front of the oval window from where it curves around the cochlear process and crosses the lateral wall to be inserted into the inner and anterior surfaces of the handle of the malleus. The tensor tympani muscle acts in opposition (antagonist) to the stapedius, and when the former contracts the handle of the malleus together with the tympanic membrane is drawn inwards, the head of the malleus and incus are tilted so that the footplate of the stapes is pressed into the oval window, thus increasing the pressure on the perilymph. In this way the intralabyrinthine pressure is regulated. The

chorda tympani nerve on its way to join the lingual nerve passes through the tympanic cavity, and the facial nerve lies in close apposition to the inner and posterior walls of the cavity. The arteries of the middle ear are derived from the internal carotid, the middle meningeal and the stylomastoid.

The Antrum is a small reservoir situated between the mastoid and the tympanic cavity of which it is an embryological part and with which it communicates through the aditus ad antrum. The antrum receives drainage from the mastoid cells.

The Mastoid Process consists of an outer shell of hard bone situated behind and below the auricle. Beneath this shell the bone becomes shot with numerous communicating air cells (diploic bone), presenting a variable and complex pattern which usually communicate through devious channels to the antrum.

The vibrations of the tympanic membrane are transmitted to the articulated chain of ossicles and conducted to the oval window where they are transmitted to the perilymph. During this process the amplitude of the wave is reduced one third while its force is increased one and one half times.

THE INTERNAL EAR

The Osseous Labyrinth may be conveniently divided into the vestibule, the semicircular canals and the cochlea.

The Vestibule is a tiny irregularly shaped space communicating with the tympanic cavity through the oval window which is closed by the footplate of the stapes. Its area contains and abuts the following structures, i.e., the utricle, the saccule, ostia of the semicircular canals, the ampullae of the semicircular canals and the opening into the scala vestibuli.

The Semicircular Canals consist of three looped channels about 2 mm in diameter with bulbous endings (ampullae) each placed at right angles to the others. With head erect the external canal is horizontal, the anterior canal is vertical from within outward and forward and the posterior canal is vertical outward and backward.

The Cochlea is a bony spiral resembling a snail shell composed of two and one-half convolutions (tubal length of about 40 mm) wound around an axis (modiolus) in the form

of a hollow cone which contains the cochlear vessels and nerves. Every convolution is divided into an outer channel (scala vestibuli) and a lower inner channel (scala tympani) by a lamina of bone extending out from the modiolus. An opening (helicotrema) establishes communication between these two channels.

The Membranous Labyrinth is enclosed within the osseous labyrinth and may be divided into the vestibular or static labyrinth and the cochlear or acoustic labyrinth.

The Vestibular Labyrinth is formed by the membranous semicircular canals and two sacs, the utricle and the saccule, united by a narrow duct. The utricle communicates with the three semicircular canals by five openings and with the saccus endolymphaticus by a duct which unites with a similar one from the saccule. The saccule communicates with the cochlear duct and indirectly with the utricle. The membranous labyrinth is surrounded by a fluid, the perilymph, and encloses a similar fluid, the endolymph. The cilia of the hair cells project into small calcium deposits (otoliths) which rest on the sensory nerve fibers within the utricle and saccule. The otoliths act as a mechanical stimulation to the hairs, varying with the position of the head to possess a kinetic function concerned with posture. The nerve-end organs of the membranous labyrinth are distributed over certain spots known as cristae, papillae and maculae.

The Acoustic Labyrinth is concerned with sound perception and consists of the terminal nerve filaments of the cochlea, the acoustic nerve and the auditory center in the brain. The cochlear duct is the membranous portion of the cochlea and is a long tube closed at both ends which communicates with the saccule by means of a canal. A thin membrane closes the upper end of the cochlear duct (Reissner's membrane). The vibrating or resonating portion of the cochlea is a tense band of fibers (basement membrane) forming the floor of the duct. Endolymph is secreted by a vascular network (stria vascularis) located in the spiral ligament (thickened periosteum), and the perilymphatic duct connects with the subarachnoid space.

The Auditory Nerve is formed by two branches, the vestibular and the acoustic, in the internal auditory canal. It carries vestibular and acoustic impulses to the medulla oblongata of

the brain where the centers communicate with other centers controlling muscular activity, thus establishing reflex arcs of equilibration and motive response to sounds. The vestibular branch sends filaments to the utricle and the superior ampullae of the semicircular canals. The cochlear branch sends filaments to the saccule and to the ampulla of the superior semicircular canal. The cochlear distribution of the auditory nerve together with its supporting structure is called the organ of Corti of which there are about 2000 cells. The nervous hair cells of the organ of Corti are arranged on the basement membrane in four or five rows, a row of modified rod-shaped supporting cells being arranged between the last and next to the last row. The nerve fibers extend from the base of the hair cells into the canals to the modiolus to join the spiral ganglion and from there into the internal auditory canal forming the acoustic branch of the auditory nerve. The hair cells are stimulated through the medium of the hairs which project from the free ends. Higher pitch tones are taken up by the hair cells near the beginning of the basal coil, while those of low pitch disturb hairs near the apex of the cochlea.

The blood supply of the labyrinth is very important from a clinical standpoint. The vessels are derived from the basilar through the labyrinthine artery and are end arteries having no anastomoses nor collateral circulatory channels, so that obstruction stops circulation. The veins find their exit through the aqueductus cochleae and vestibuli.

Sound waves are transformed into fluid waves at the oval window where the movement of the perilymph brings about a sympathetic vibration of the basilar membrane, various regions being made to vibrate by fluid waves of certain lengths and frequencies, which, in turn, stimulate the overlying hair cells to form an impulse in the cochlear nerve which is conducted to the brain where it is interpreted as sound. Slight movements of the basilar membrane (low intensities) excite the external hair cells, while relatively greater excursions of the membrane (high intensities, probably over 30 decibels) are required to excite the internal hair cells, so that tones of different pitch excite the hair cells in different regions of the cochlea, i.e., the lower the tone the higher up in the spiral of the cochlea are the receptors excited.

The angle of the impact of the otoliths in the saccule and utricle creates a sensation which, upon being interpreted by the brain centers, gives consciousness as to the relative position of the head to the line of gravity and to the plane of the earth (static equilibrium). The nerve endings (cristae) in the ampullae of the semicircular canals are concerned with the regulation of equilibrium when the head is moved (rotated, rocked or tilted) and thus preside over dynamic equilibrium.

The normal range of hearing for man is from 16 to 22,000 double vibrations (cycles) per second. As age progresses the upper range is normally lowered to about 16,000 cycles. The difference in intensity of sound is measured in decibels, the smallest increase in sound intensity detectable by the normal ear. Ten decibels would mean a tenfold increase in sound intensity. Normally sound is conducted about twice as long through the ear by air conduction as it is by bone conduction, i.e., through the bones of the skull. The appended table indicates some common frequency ranges.

HARMONICS	Cycles	SOUNDS	Cycles
Vocal	80-1200	Thunder	20-40
Strings	42-3000	Waterfall	40-50
Piano	20-4608	Voice	256-2048
Wind	60-4608	Phone	250-2750
		Radio	50-6000
		Film	50-8000
		Insects	14000

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EDUCATIONAL PSYCHOLOGY: THE ROLE OF MEASUREMENTS.—

Educational psychology is a mixture of beliefs, fragmentary data of a superficial nature, some keen insights, and a developing technique of exploration and evaluation. Except for the few ideas borrowed from psychology and psychophysics, it started the present century with little more than some outworn beliefs derived from instructional practices that had survived a trial and error process. It was quick to borrow the mathematical techniques of analysis, from those of correlation to those of analysis of variance, and to adapt them effectively to its own use. In this process of adaptation numerous refinements have been worked out and some of the

mathematical procedures greatly extended, as in factor analysis.

It is in the field of measurement, however, that it has made its unique progress, for in this field it could borrow but little beyond the techniques of psychophysics. Its progress as a science has been limited by the necessity of creating and refining all its own measuring instruments as well as of isolating the qualities to be measured through the development of such instruments and the statistical analysis of the data derived from their use. Whatever ideas make up the content of educational psychology today beyond or in contradiction to earlier beliefs have been largely derived from such data. As advances are made in the techniques of measurement and analysis of data, and actual principles underlying mental activities are discovered, these newer ideas—such as maturation of intelligence, readiness for a new subject like algebra through growth, and memorizing ideas mainly through repetition—derived from a very different source than the current practices which follow them, will also undergo marked revision. The level which educational psychology has reached is best reflected by the precision with which measurement of intellectual functions can be made and the adequacy with which such data can be quantitatively analyzed. Since other articles deal with the techniques of analysis, this one will be confined to the development of measuring instruments.

The earliest forms of measurement in education were the subjective evaluation of a child's handwriting, his composition in English, his oral reading of a paragraph or poem, his paragraph answers to questions in history, the oral or written spelling of words and the doing of exercises or problems in arithmetic. The quality of the finished products in handwriting, composition, oral reading and paragraph answers, and the number of correct products in spelling and arithmetic furnished the bases of subjective evaluations without any definite, objective standards.

Out of the handwriting samples, English theses and drawings have come the handwriting scales, English composition scales and drawing scales. In place of the paragraph answers to questions we now have the objective type of questions calling for one or more choices from several suggested answers, one or more blank

spaces in a sentence to be filled in, or a series of statements to be arranged in order for some quality. With this change in form the emphasis has been shifted from recall to recognition, from writing a group of associated ideas if not interrelated ones, to the selection of an idea apparently but not actually stripped of most of its associations and interrelations.

Since the product scales were the first ones to be developed in educational psychology the methods of their construction will be taken up first. In the development of the Thorndike handwriting scales a collection of specimens spreading over a wide range of quality were sorted into piles for merit by a group of competent judges of handwriting. On the assumptions that the variations in assignment of a specimen to different piles resulted from errors of judgment and that these errors of judgment, due to many independent factors, would approximate a normal distribution surface in form, scale values were assigned to each specimen on the basis of the frequencies with which it appeared in each of the contiguous piles.

In the development of the Hillegas English composition scale a more refined technique, the rank order method, was used in scaling the samples. After some 40 specimens of composition writing had been selected from the piles in which a larger number covering a wide range of quality had been distributed by people competent in English, these selected specimens were submitted to a group of approximately 400 teachers of English to arrange in order of merit from the poorest specimen to the best one.

After the arrangements of the judges had been tabulated, the numbers of times each specimen was rated higher than each other one were converted into quartile deviation or probable error values with the use of a probability table. The specimen selected as having a zero value was one that half of the group of original judges considered a composition, while the other half believed it too lacking in merit to be considered a composition at all. If the next better specimen was rated better than the zero specimen by 84.4 per cent of the group of 400 judges, the 84.4 per cent was converted into the probable error value of 1.50. Specimens were selected for the scale that fell closest to one probable error unit apart, or a distance

apart equivalent to a difference noticed by 75 per cent of the group of judges. This technique of constructing quality measuring instruments was later applied in the development of scales for measuring specific qualities of English composition, drawing and sewing. It has also been used in developing instruments for measuring attitudes.

The rank order technique of determining the scale values of samples has not only been shown to possess internal consistency: that is, a specimen somewhat distant from another specimen will have the same scale value, within very narrow limits, whether determined from the percentage of "better judgments" or from the addition of intermediate distances; but the scale values derived by means of it show a linear relationship with the scale values determined by the paired comparison and successive intervals techniques. The basis of these various psychophysical techniques of determining scale values of samples is discussed in detail by Thurstone in his article, "Measurement in Psychophysics."

In the earlier tests involving the use of objective tasks, the list of tasks were frequently mixtures of several types of tasks. There might be a few multiple-choice type of tasks—a statement or question followed by several short, concise answers, one or more of which were acceptable without the subject being told the number to be selected as right; a few single-choice type of tasks similar to the multiple-choice type, except that there was only one acceptable answer and the subject was so informed; a few completion exercises with one or more blank spaces in the sentences to be filled in; a few tasks containing several items to be arranged in order for some quality; and a few matching questions, which were usually poor combinations of the single-choice type of tasks. The score was the number correctly done. On the single-choice type of task there might be a considerable amount of guessing, on the multiple-choice type less but with no possible way of making a correction for the guessing as it varied from one type of task to another. In the earlier tests in spelling and arithmetic the tasks were all of the same type—words to be written or exercises to be done. In the Trabue language-completion exercises the tasks were all of the completion type. In the group mental

tests the tasks in each subgroup were alike but varied from one subgroup of tasks to another.

In the development of the early scales in spelling by Buckingham and by Ayres, in arithmetic by Woody, in language completion exercises by Trabue, and in American history by Van Wagenen, the selected list of tasks were administered to several hundred children in several school grades. On the basis of the assumption that the distribution of a school ability among a large group of children of the same age or in the same grade would approximate a normal distribution surface, since it would probably be the result of a large number of independent factors working together, the percentages of subjects in a grade doing each task correctly were transformed into scale values with the use of a probability table giving the areas of the normal surface of frequency corresponding to each P. E. distance ($x/P.E.$) from the median of the distribution. If 25 per cent of the subjects in grade 5, 50 per cent of those in grade 6, and 75 per cent of those in grade 7 did a task correctly, this task would have a scale value of -1 P. E. in grade 5, 0 P. E. in grade 6 and $+1$ P. E. in grade 7. By determining the P. E. distances between the grade medians on the basis of all the tasks, the scale values for the sixth and seventh grades could be referred to that of the fifth grade by subtracting from each scale value the corresponding grade difference above the median of the fifth grade. The average of the three or more scale values derived from several grade groups would not only give a reasonably stable scale value, one with a probable error of 0.2 of a P. E., but also smooth out minor variations in the grade distributions and make it feasible to cull out erratic performing tasks, such as the few done but little better in a higher grade than in a lower grade. In determining the scale values of the tasks different weights were assigned to the tasks nearer the median value of a grade than to those farther away by different authors, but the practice of using the quartile deviation was followed by all except Ayres, who used the standard deviation.

These lists of tasks with their carefully determined scale values were not actual scales, however, since the scale values of the tasks had no direct relation to the raw score or number of tasks correctly done on the list. The selection

of small lists of tasks evenly spaced apart still yielded raw scores. Only in the case of the Woody arithmetic scales was it feasible to find the scale value for a class, and this required the tabulation of the tasks correctly done by each pupil.

In the meantime the Thorndike reading scale alpha 2 had been developed and a technique devised whereby a pupil's scale score, showing the level of difficulty at which he could do 80 per cent of the tasks correctly, could be obtained from a rather lengthy table of numbers of correct responses to items at successive levels of difficulty. The tasks in this case were direct questions to which the answers could be found in the paragraphs to which the questions referred. Since pupils gave many different answers to each question, scoring keys giving acceptable and non-acceptable answers were necessary. To make the scoring simpler and to insure uniformity of scoring, scoring keys accompanied practically all published objective tests.

From the use of this reading scale two techniques of obtaining scale scores for individual subjects have been developed: the T-score technique and the C-score technique. With the T-score technique, as used in the development of the Thorndike-McCall reading scales, the same assumption of normality of distribution of a school ability like reading is made as in determining the scale values of individual tasks. In this technique, however, it is the number of tasks correctly done for which the scale value is determined. As the list of tasks cannot be changed after the scaling procedure begins, the items must be selected with extreme care for each duplicate form of the scale. After the several final lists of tasks have been administered to several hundred children, preferably of the same age, the number of pupils who surpass each number of tasks correctly, plus one-half of those succeeding with that number of tasks, is changed into a percentage. With a probability table this percentage is changed into a scale value. If 480 out of 1000 children completed more than 19 tasks correctly and 40 more completed 19 tasks, the number to be converted into a percentage would be 480 plus $\frac{1}{2}(40)$ or 500. The percentage 50 falls exactly in the center of the distribution. In the Thorndike-McCall reading scales this point for the 12-year-

old children, to whom the tasks were administered, was set at 50 T-score units, since this point was estimated from available data to be approximately five standard deviations above an absolute zero point of reading ability. By making it 50 instead of 5, and using the standard deviation as the unit, the T-score unit is thus one-tenth of a standard deviation of twelve-year-old children for this scale. If 828 of the same 1000 twelve-year-old children completed more than 12 of the tasks and 26 more did 12 tasks correctly the number 828 plus $\frac{1}{2}(26)$ or 841 is equivalent to -1 standard deviation below the median, hence a raw score of 12 has a scale value of 40, while the raw score of 19 had a scale value of 50.

Although the list of tasks cannot be altered after the scaling process has been started, there are many areas, such as reading or vocabulary, in which no change in a carefully selected list of tasks will be needed. It offers the advantage that all the tasks set up can be used in the scales, provided a normal distribution of the ability to be measured can be obtained. It is not always feasible to secure an unselected age group, however. In that case a large group can be measured for some closely related function and a close approximation to a normally distributed group selected on which to determine the T-score values of each number of tasks correctly done on each of the duplicate lists. All duplicate lists have to be given to the same group and all culling of items and arranging of tasks from easy to difficult ones in each list done before the scaling procedure is undertaken.

When the usually selected list of tasks used in an experiment is subjected to the T-score technique, it reveals wide differences in the spacing apart of the raw scores and the questionableness of applying refined statistical techniques to data such that the second standard deviation from the mean in terms of the raw scores may be as much as three standard deviations from the mean in terms of the T-scores. The consistency and equality of the unit of measurement in the T-score scale cannot be tested internally but only by applying it to groups that are known to yield a close approximation to a normal distribution in a closely related trait or by checking it with the C-score units to be described next, that can be tested for internal consistency or same proportion correct at all

levels of difficulty and for equality of units or units of the same size throughout the range of the scale.

From data derived from the Thorndike reading scale alpha 2, it was noted by Kelley that the proportions of correct answers at successive levels of difficulty away from the 50 per cent level tended to conform to an ogive curve, the curve that is obtained when the lower half of the normal distribution curve is reversed in direction. On the basis of this insight the Kelley-Trabue language-completion exercises alpha and beta were developed from the original Trabue language-completion tasks and some additional ones. These lists extended over a range of ten quartile deviations with five tasks spaced one-fifth of a quartile deviation apart within each quartile deviation on the scale. On the basis of the ogive curve and the proportions of tasks correctly done at the lowest and highest quartile deviation intervals, it was possible to predict the number of tasks that would be correctly done at all lower and higher quartile deviation intervals of difficulty. Then a technique was developed whereby, on the basis of the numbers done within each of the ten quartile deviation intervals and the predicted numbers in all other intervals, the level of difficulty at which an individual could do just half of the tasks attempted could be calculated.

The next step was the development by Van Wagenen of tables for making the predictions and combining them with the numbers correctly done to find the 50 per cent level of attainment. Later tables were developed for making the predictions at the unattempted levels on the basis of the numbers done at all attempted levels, combining these predictions with the total numbers correctly done within the range attempted and deriving the 50 per cent level directly from the number correctly done within the limited range of the test. This step made the C-score scales as simple to use as the T-score scales,—reading the scale score on a table from the equivalent number correctly done. The range of difficulty may even be limited to tasks of the same difficulty, in which case the scale is a horizontal one in contrast to the vertical scale with the tasks evenly spaced apart throughout the range of the scale. The close correspondence between the actual

proportions of the tasks correctly done at each level of difficulty by large numbers of individuals making the same C-score and the theoretical proportions based on the ogive curve in the case of reading for comprehension, vocabulary, abilities in arithmetic and ranges of information not only substantiated the method of finding the C-scores from limited ranges of tasks but provides a technique for determining the scale values of the tasks that are independent of the distribution of the abilities in the group from which the scale values are derived. By basing the scale values only on the proportions doing each task correctly in the case of the individuals in the middle of the group in ability, variations resulting from skewness at the extremes are avoided, regardless of whether they result from biased selections of cases, from differential instruction for dull and gifted children, or from constriction of the range of abilities, as has been found in the spelling abilities of a grade or age group. However, the results of only a limited proportion of the total group tested—the 10 to 20 per cent of individuals in the middle of the group in ability,—can be used, but a much higher degree of precision in scale values can be obtained.

Even at the beginning of this century the fundamental basis of the C-score technique had already been anticipated. The French psychologist Binet, in the first publication of the Binet-Simon individual mental examination, had selected the tasks for each age level on the basis of the proportion of children who were able to do them. The mental age of a child was determined by substituting for each task missed at a lower age level a more difficult task correctly done at a higher age level until all the blank spaces had been filled. The present Stanford-Revision of the Binet-Simon individual examination was built up on the same basis but with larger and more representatively selected age groups. The present method of finding a child's mental age by starting with a basic mental age at which all the tests tried are done and then adding two months for each task done out of the six at each mental age level gives the same mental age as filling in the blank spaces. The child's mental age is thus the level at which 50 per cent of the tasks attempted can be done. The assumption underlying the technique is that just as many more difficult

tasks will be done above this level as easier ones below it will be missed. The C-score technique goes one step farther in assuming that the distribution of the proportions of tasks correctly done at each level will approximate the percentages on the ogive curve, an assumption that has the support of a large amount of evidence. The individual mental examination is thus a C-score scale, with the mental year as the unit of measurement.

The simplest form of the C-score scale would consist of an unlimited range of tasks, starting at an absolute zero point and continuing indefinitely at equal intervals apart, like the inches on a yardstick. With such a scale merely counting up the number of tasks correctly done would indicate the level of difficulty at which 50 per cent of any number of tasks attempted at that level of difficulty could be done correctly. Such an instrument, however, would include too many items over the long range of at least 200 tasks spaced one-tenth of a quartile deviation apart. Even if it were possible to establish an absolute zero point of an ability a large proportion of the tasks would, for any individual, be either so easy that there would be some missed due to carelessness or else so difficult that the individual would give up before the upper limit was reached. For this reason the possibility of limiting the range of task difficulties to that appropriate for a grade or age group of individuals is highly advantageous where such a limitation can be made without any appreciable loss in precision or accuracy. The C-score technique makes it feasible to keep the tasks within any desired range of difficulties, with any number of tasks within that range so long as they are evenly spaced apart in difficulty or with the same number of tasks at each level of difficulty within the selected range of difficulties, and at the same time incorporate in the scoring keys a correction for the element of guessing when the single-choice type of task involving guessing is used. Also new tasks may be substituted for old ones of equal difficulty without changing the C-scores derived from the scale.

As the C-score scale can be broken up into limited ranges of task difficulties, different ranges have been given to the same group of individuals and the instruments tested internally for consistency and equality of the unit of meas-

urement throughout the range of the scale, just as a yardstick might be tested by cutting off the first foot and then seeing if the remaining two feet would give the same amounts of length for different things as the original three-foot yardstick gave. Even when there is no overlapping of tasks difficulties from one range to another in scales administered to the same group of individuals, the median C-scores on different ranges lie within the standard error of the mean derived from one of the limited ranges as often as would occur as a result of random selection.

The C-scores not only make it feasible to compare gains made at different levels of attainment and to compare attainment levels with norms with precision and a known degree of accuracy, but also to refer to tasks on the scale having the same difficulty value as the C-score of the individual. Thus it is feasible to see concretely just what kind of tasks an individual can do correctly in half the attempts he makes or with any other percentage of correctness, and also to see concretely just what the norms for successive age or grade levels mean in terms of task difficulties.

The C-score has one limitation in common with the T-score, however, which only the use of the long form can overcome. While the tasks are equal distances apart in difficulty and the unit is a uniform one throughout the range of the scale, the use of a limited range of task difficulties yields C-scores that are not evenly expressed apart. Those near the center of the scale may be one unit apart, those somewhat farther from the center one and a half units apart, and those at the extremes two and even two and a half or three units apart. The distances apart, however, are expressed in terms of the unit that is of equal size throughout the range of the scale. The T-scores and C-scores resemble the readings from a yardstick with the marks at one inch, two inches, three inches up to 12 inches, then at 14 inches, 16 inches up to 26 inches, then at 29 inches, 32 inches and 36 inches. This feature is a result of limiting the range of the task difficulties. It is in this respect that the C-scores and T-scores differ from raw scores and z-scores or standard scores. These give the appearance of being equal distances apart because the numbers are at unit distances apart, when they are actually far more unevenly

spaced apart than the raw scores on the C-score scales. The T-scores and C-scores indicate just how far apart the measures are, which makes them usable for all refined statistical analyses.

The distinction commonly made between the T-score scales and the C-score scales, that the T-score scale is based on the standard deviation and the C-score scale on the quartile deviation, is an entirely fallacious one. The mental age on the Stanford Revision of the Binet-Simon individual mental examination is a C-score based on an age unit, the score on the Thorndike C. A. V. D. intelligence examination is a C-score based on the standard deviation as the unit of measurement, while the score on the Van Wagenen unit scales of aptitude is a C-score based on the quartile deviation as the unit of measurement. Both the standard deviation and the quartile deviation have been used as the unit of measurement in the T-score scales.

The T-score is also confused by some authors with the z-score or standard score. The z-score is obtained directly from the raw score on a test by dividing the difference between the raw score and the mean of the raw scores by a standard deviation calculated from the raw scores. The distances between successive raw scores on a test are very unequal and tend to grow much larger toward the extremes due to the clustering of the items around the center of the test and the spreading apart of the items in difficulty toward the extremes of the test. The standard deviation calculated from such a variety of units is utterly lacking in quantitative meaning and bears no relation to the variations in distance apart of the raw scores. The procedures of changing the unequal distances apart of the raw scores into the larger unit represented by the standard deviation of raw scores has no effect upon the inequality of the original raw-score units. The same defects are present in the z-scores or standard scores that were present in the original raw scores; not a single one was removed by the application of magic.

On the basis of the techniques so far discussed it will be feasible to consider more adequately other kinds of measures and indices widely used in education and educational psychology. The one most commonly used is the grade norm or standard. This is usually the median of the raw scores on a test that has been

given to many children in successive school grades. Although these norms depend on the selection of the groups, they provide definite numerical levels with which individual scores may be compared for interpretative purposes. By the grade designation 4.2 is meant two months beyond the beginning of the fourth grade. Their value for comparisons is limited by the fact that different subjects are given different amounts of emphasis in different grades, that a pupil's attainment level is more dependent upon his mental age than upon his grade location, and the subjects change from year to year above the eighth grade. In a large city, groups of pupils in the same grade in different schools may differ by as much as two and a half years in median mental ages.

Nearly all group mental tests and some achievement tests use the age norm or standard. The raw mental test score is compared with the median raw scores of groups of pupils at successive chronological age levels and interpreted as the mental age (M.A.) in years and months to which it corresponds among the median raw scores or norms. The age measure suffers the limitation that at the higher ages the pupils make smaller gains in raw scores than at the lower ages in most of the content used in the mental tests. The common interpretation that intelligence levels off and becomes stationary at the higher age levels as height does is too questionable an interpretation and too simple an explanation in view of all the other factors that might be involved, such as familiarity with the environment, redirection and specialization of interests and dropping out of school.

The educational age (E.A.) is derived from an achievement test in the same manner as the mental age is derived from a group mental test. It suffers from the limitation that a larger proportion of the older and less capable pupils and a smaller proportion of the gifted pupils are found in the higher elementary grades than in the lower grades and that only the less able pupils at ages above 14 tend to be found in the eighth grade.

From these age scores three indices may be derived: the intelligence quotient (I.Q.) or mental age divided by the chronological age; the educational quotient (E.Q.) or educational

age divided by the chronological age; and the accomplishment quotient (A.Q.) or educational age divided by the mental age. The intelligence quotient, which first came into use with the Stanford Revision of the Binet-Simon individual mental examination, is a measure of the general rate of learning from birth to the time the mental test from which it is derived was given. Since the distribution of intelligence quotients tends to approximate a normal distribution surface for an age group, their distances apart tend to be approximately equal. Any conditions of learning, whether internal or environmental, that influence this general rate of learning temporarily can have but a small effect on the intelligence quotient. It varies, however, with the variations in content from one kind of mental test to another and becomes highly unstable at the higher ages when amounts of the test content learned tend to decrease from year to year. The educational quotient is a similar measure of the general rate with which the content of a school subject has been learned over a period of years. Variations in emphasis from grade to grade tend to produce greater changes in the educational quotient than occur in the intelligence quotient, but these changes are too much smoothed out by long time effects to be of use in evaluating a pupil's school accomplishment over a limited period such as a year. The accomplishment quotient is a measure of the relation of the rate of school learning to the rate of learning in general. Since it, too, covers the period since birth even marked changes in the relation over any one year can produce only small changes in the accomplishment quotient. The per cent placement, first used in the Minnesota preschool scales and the Van Wagenen unit scales of aptitude is an index based on the assumption of a normal distribution of a function in an age group. It shows the percentage of the way a child stands between the lowest and highest of a representative 1000 children of his age. It is thus a precise measure derived from age and scale score tables, but independent of age limitations. Any variation in it, apart from errors of measurement, indicates the amount of change in position in a function independent of the changes in position of others. It can be determined independently for each kind of content in a test, and a cor-

rected weighted average may be obtained that makes all the partial ones comparable with that for the total test. All the indices so far mentioned are based on 100 as normal or average.

Another widely used index of an entirely different nature is the percentile rank or an individual's rank in his own group changed to what his rank would be among one hundred individuals in a similar group. It is readily found by multiplying his rank in his own group by 2, subtracting 1, dividing the remainder by two times the number in his own group and then moving the decimal point two places to the right ($P. R. = \frac{2R - 1}{2N} \times 100$). Unlike the

per cent placement or intelligence quotient, the distances apart in percentile ranks increase from the middle percentile rank of 50 toward the extremes in quite the same manner as do z-scores or standard scores and raw scores. It can be used for interpretative purposes but even for this use its value is more limited than that of grade norms or age norms.

The use of precise measurements is not only essential to secure precision in experimental work, but the analyses of the more precise measurements of mental functions are contributing quite as much to the advancement of educational psychology as the use of the more refined statistical techniques in the analysis of experimental data. The growth studies carried on over a period of several years, such as those of young children in the Child Welfare Institutes, the Harvard growth study with several hundred children over a period of several years with the individual mental examination, and the Minnesota growth study in several separate mental functions with several thousand children in grade 4 through 12 over a four year period, have provided a wealth of information regarding changes in rates of learning. Likewise the analyses of the proportions of items done at different levels of difficulty by children of the same mental level but of different degrees of brightness and in different school grades have contributed considerable information regarding the relative effects of nature and nurture upon changes in attainment levels.

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EDUCATIONAL PSYCHOLOGY: THE ROLE OF STATISTICS.

—Just as in any other science, progress in educational psychology has been the result of insights. In the accumulation of ideas statistics has played a double role: the arrangement of measurements in statistical tables and the analysis of such rearranged data which make many insights possible; at the same time statistics affords a technique of determining the dependability of the insights. The use of statistical techniques has centered around three main problems: the analysis of data assembled in investigations and experiments; the development of measuring instruments; and the quest for underlying causal factors. The last phase has been a highly specialized one and its use of statistics confined to a small group of specialists in analyzing mental measurements and reading measurements. The earlier techniques of correlation and partial correlation proved inadequate; the later, more promising techniques of factor analysis, still in the formative stage, are discussed elsewhere (*see* Multiple Factor Analysis). The statistical procedures and assumptions involved in measurement are taken up in the article, "Educational Psychology: the Role of Measurement (*q.v.*)". The present article will deal with the statistical processes that make the discovery of information and the determination of its dependability feasible.

The simplest procedure is the arrangement of data in the form of a distribution table containing one or more arrays or columns, with the measures-intervals at the left and other measures-intervals, such as ages by years, or discrete categories, such as sex groups, at the top. When the measures are entered according to selected intervals in both directions, as on a scatter-graph, the table shows the trends in both the measured functions and also the relation between the measures in the two functions. When the original measures are arranged in scatter-graphs, the calculation of measures of central tendency, variability, and relationship is greatly facilitated.

The simplest statistic or measure derived from other measures is the percentile or point within an interval on a scale on the smaller side of which the expressed percentage of measures lies, assuming that the measures within each interval, such as a year, a month, or three inches, are scattered evenly along the interval. After finding the per cent of the cases needed to reach the desired percentile, the cases are counted up to the nearest point reached without including more cases than the required per cent. The difference between the number counted and the required number is taken as the numerator and the number of cases within the interval as the denominator of the ratio by which the size of the interval is multiplied. This amount added to the beginning point of the interval gives the desired percentile. The most commonly used percentile is the 50 percentile or median. From the 25 percentile and the 75 percentile the interquartile range is found. This is the number of intervals or units between the 25 percentile and the 75 percentile points, and includes the middle 50 per cent of the cases in the distribution. The quartile deviation (*Q*) is obtained by dividing the interquartile range by 2. In a normal distribution of cases, the quartile deviation is referred to as probable error (*P. E.*), since it shows the limits within which the chances are even that any measure selected at random from the distribution will fall.

Although the median and the quartile deviation have been effectively used in many investigations to show trends—changes in central tendency and in variability in one function corresponding to changes in a second function—the arithmetic mean and the standard deviation have been used in the more refined techniques of experimentation based upon random samplings of populations.

The arithmetic mean, a point within an interval on a scale on either side of which there is an equal amount of weight, rather than an equal number of cases as with the median, is found by dividing the sum of the measures by their number. If the intervals or the measures are beginning-point measures, such as a 12-year-old (meaning "having lived at least 12 years, and usually somewhat longer"), the obtained mean is found by adding one-half of the size of the interval to the calculated mean.

Instead of dealing with the measures as collected in their usual original form, they are referred to the arithmetic mean as a point of reference and expressed in terms of the number of units they are above the mean or below the mean. These are also the differences between the original measures and the mean, or the deviations from the mean as well as the expression of the original measures referred to the mean as a point of reference. It is these newly expressed measures or deviations from the mean that are the units of all analytical work, even though the procedures and their formulas may use the original measures or the variations from a guessed average.

The standard deviation or sigma is the number of units represented on the base line of a normal surface of frequency between the perpendicular line at the mean, cutting the surface into two equal parts, and the perpendicular dropped to the base line from the intersection of the two parabolas constituting the bounding line on either side of the mean. This distance is 1.4825 times the size of the probable error and includes 34.13 per cent of the cases on either side of the mean, in contrast with the 25 per cent on either side of the median in a probable error or quartile deviation of a normal surface of frequency. It is found by squaring the deviations, finding the sum of the squares, dividing this sum by the number of cases, and then finding the square root. The sum of the squares of the deviations divided by the number of cases or the mean of the squares of the deviations is the variance.

The arithmetic mean may be more readily obtained by using a guessed average selected near the center of the distribution, and the sum of the variations from this guessed average divided by the number of cases. This correction added algebraically to the guessed average gives the obtained arithmetic mean. The variance may also be readily calculated from the guessed average and the variations from it. The variance equals the sum of the squares of the variations divided by the number of cases less the square of the correction *delta*, while the standard deviation is its square root. The variance may also be found from the original measures by finding the sum of the squares of the measures, and then dividing this sum by the number of cases and subtracting the square of the sum

of the measures divided by the number of cases. The standard deviation may be found by taking the square root of this result.

When there are two series of measures of the same trait for the same individuals, the original measures of the second series are usually designated Y , their mean Y or M_y , the deviations y , the variance SD_y^2 , the standard deviations SD_y , and the variations from a guessed average n . The pair of deviations (x, y) for each individual may be multiplied together and their algebraic sum divided by the number of cases to obtain another variance, which is the variance of the individuals or the variance of either group of measures or total variance, less the variance of the errors of measurement (included with the true variance within the total variance). The ratio of this true variance or variance of the individuals to the product of the two standard deviations is the Pearson product-moment coefficient of correlation, usually designated r . When the two series of measures are duplicate measures of the same individuals made with different instruments, the variances are theoretically equal and the product of the two standard deviations equals the variance of either. Consequently, the coefficient of correlation in this case, called a reliability coefficient, is the ratio of the true variance to the obtained variance, and the variance of the errors of measurement will be the variance of the measures less the true variance. Since the variances of the x measures and the y measures are seldom exactly equal, the standard error of measurement may be obtained from the formulas SD_x error of the x measures equals SD_x times the square root of $1-r$ and SD_y error of the y measures equals SD_y times the square root of $1-r$.

The product of the deviations, or of the measures referred to the mean as a point of reference, may be obtained from the variations from a guessed average by multiplying the variations together, finding their algebraic sum, dividing this sum by the number of cases, and subtracting from this result the product of the two *deltas*. When the original measures are used, the true variance or p is the sum of the products of the original measures divided by the number of cases, less the sum of the original measures in each series divided by the number of cases.

With these simple processes one may proceed to analyze series of measures to determine whether one set of conditions produce better results than another. To do this one requires an initial and final set of measurements for two or more groups working under different conditions; one group, called the control group, working under the usual conditions; the other group or groups working under selected sets of conditions with all other conditions the same as those of the control group. To determine whether the set of conditions under which any group works produces better results than is produced under the usual conditions one needs to compare the gains made by the different groups. Instead of determining the gain for each individual in each of the groups, one determines the arithmetic means of the initial and final measures of each group, subtracts the initial means from the corresponding final means to obtain the mean gain of each group and then subtracts the mean gain of the control group from the mean gain of each of the experimental groups. The statistical calculations are thus simple and straightforward: finding the initial means for each group, the final means, the mean gains and the differences in mean gains.

With these results at hand it now becomes a matter of determining how dependable the differences are and to what elements in the conditions they may be due. In the first place the scores used are inaccurate and usually very coarse or even crude. To obtain a reasonably refined set of measures would require a test of many items of the same difficulty values or equally spaced apart in difficulty and extending over a wide range of difficulty values. Such a refined list of tasks would still yield inaccurate scores since any list of tasks would be at best only a sampling of the total list of available tasks. If the tasks in a pool from which the sample might be drawn were all of the same difficulty, did not duplicate one another and were known by just one-half of the subjects tested, less than half of the subjects would be likely to obtain a score of just half of the tasks in the test even though each one knew just half of the tasks in the pool. In such a case, the standard error of the score would be the square root of n times $\frac{1}{2}$ plus $\frac{1}{2}$, in which n (the number of tasks in the test) is the exponent of the binomial expression $\frac{1}{2}$ plus $\frac{1}{2}$ to the n

power. If the test consisted of 100 such tasks, the standard error of the scores would be the square root of $100/4$, or 5 tasks. This is the same as the standard error that would be obtained from a group of subjects with different levels of ability given duplicate sets of 100 items at the same level or levels of difficulty and without duplication of items from the first to the second test, if the variance of the products of the deviations were subtracted from the total variance of the scores on either test and the square root taken or if the variance of the scores on either test were multiplied by the reliability coefficient and the square root taken. From the probability tables giving the proportions of the total surface of frequency corresponding to x/SD , this standard error of 5 may be interpreted to mean that any individual in the group had 68.26 chances out of 100 of making a score between 45 and 55 and that his chances were even of making a score between 46.62 and 53.37. In interpreting individual measures the standard error of measurement is of great importance, which makes it all the more necessary that it be not confused with the coefficient of reliability, which is merely a device for finding the standard error of measurement.

Since with the same number of items in a test the standard error of measurement remain constant for that level of difficulty, within limits of its probable error, it follows that the wider the spread of abilities in a group the larger will be the variance of the measures of the group and the larger the true variance or variance of the individuals, and also the larger will be the ratio of the true variance to the total variance of the measures, since they increase at the same rate. Consequently the size of the coefficient of reliability is a function of the spread of abilities in the group rather than a measure of the quality of the test. It is also a function of the duplication of items between a test and its duplicate test, since the duplicate items do not enter into the variance of the errors of measurement but into the true variance only while entering into the total variance of the scores, thus increasing the coefficient of reliability still more.

In comparing the difference between the means of an experimental group with that between the means of the control group, the question at once arises, "Could the difference be

tween the differences have occurred just as a matter of sampling and errors of measurement?" Although we cannot obtain true statistics for the population from which the samples were drawn, we can obtain estimates of these true measures from the obtained measures or statistics. From the standard deviation of a sample we can estimate the standard error of the mean or the standard deviation of the means of the samples from the mean of the population by dividing the standard deviation of the sample by the square root of the number of cases in the sample less one. Likewise, from the standard errors of the two means we may obtain the standard error of the difference between the two obtained means or the standard error of the mean of the gains by taking the square root of the sum of the squares of the standard errors of the two means if there is no correlation between the initial and final measures or no spread of abilities in either the initial or final measurements.

Whether the same test or a duplicate test is administered at the end of the experimental period, there is likely to be some relationship between the scores of the same individuals on the initial and final tests or some spread of abilities. The effect of this relationship or spread of abilities is eliminated by subtracting two times the correlation coefficient between the initial and final measures times the standard errors of the two means from the sum of the squares of the standard errors of the two means. This standard error of the difference between means or of the mean difference is the square root of the sum of the squares of the deviations of the differences between initial and final scores from their mean, divided by the number of differences times the number of differences less one.

From the standard errors of the differences between the means or of the mean gains of the experimental (E) and control (C) groups, the standard error of the difference between the mean gains of the two groups may now be determined by taking the square root of the sum of the squares of the standard errors of the mean gains of each group, or in terms of the deviations of the original measures from their respective means.

The difference between the mean gains of the two groups divided by the standard error of this difference gives the value of t or the value

of the ratio of the difference to its standard error. This t corresponds to x/SD in the probability table, from which the chances that the difference in gains might have been the result of random selection of the two groups may be readily determined. When the number of cases is small Student's Table for t should be used. If the t is only .6745 the chances are even that the difference might have occurred as a result of the random sampling. When t is 1.96 there are still 5 chances out of 100 that it might have occurred as a result of selection, and even when t is 2.58 there is one chance out of 100 that it might have occurred as a result of random selection of samples.

The value of t may also be interpreted as indicating that the chances would be less than 5 in 100 at the 5 per cent level of confidence of getting a t as large as 1.96 times the standard error of the measure in a random sampling of that size or that the chances would be less than one in 100 at the one per cent level of confidence of getting a t 2.58 times the standard error of the measure in a random sampling of that size. Both the Snedecor table and the Fisher Z-table give the values of t at the 5 per cent level of confidence and at the one per cent level of confidence, while the Fisher Z-table gives them at the 2 per cent level of confidence and at each 10 per cent level of confidence up to the 90 per cent level of confidence.

When the individuals in the experimental and control groups have been matched on the basis of initial measures and some criterion highly related to the function under investigation the value of t may be found directly by dividing the mean gain or the difference between the means of the final measures of the two groups by the standard error of the difference. From this type of experimentation one cannot infer that the effects found would tend to hold true for a population or for a random sampling of it, but it does make feasible the determination of differential effects upon controlled selections of cases, as illustrated by the differential effectiveness of certain methods of instruction with bright and less bright pupils.

To make an effective use of achievement test results in relation to mental test results for individuals as well as predicting success in vocations from earlier tests, it is necessary to set up a basis of predicting normal attainment levels from mental or aptitude test levels. Such

predictions are based upon locating the normal expected levels of attainment in a column of Y measures corresponding to the individual's mental level indicated by an X measure. This is done by determining from data in both functions the slope of the best fitting straight line of y on x or the regression equation of the line y on x . The regression coefficient may be used for locating the points on the regression line. The predicted value for any point of the regression line corresponding to the value of X is the mean of the Y measures plus the regression ratio times the difference between the X measure and the mean of the Y measures. Any number of factors with different weights may enter into the prediction. The weights of such factors are obtained from the p 's and the SD's and the solution of the simultaneous equations in which the values of p and SD have been substituted.

The standard error of the actual Y measures from such predicted measures or the points on the regression line y on x , corresponding to each X measure, is the standard deviation of the Y measures from the predicted points on the regression line. It may be obtained by multiplying the standard deviation of the Y measures by the square root of one minus the square of the coefficient of reliability. Since the variance of the Y measures from the mean of the Y measures minus the variance of the Y measures from the points on the regression line equals $r^2 SD_y^2$, $r^2 SD_y^2$ is the variance of the points on the regression line from the mean of the Y measures; and the variance of the Y measures from the points on the regression line is the variance of the Y measures minus r^2 times the variance of the Y measures. The coefficient of correlation squared is the ratio of the variance of the points on the regression line from the mean of all the measures, multiplied by the number of cases in the columns, to the variance of the Y measures from the mean of all the Y measures. In case the relationship between the two sets of measures is not linear, the variance of the Y measures from the means of the columns will differ considerably from the variance of the Y measures from the points on the regression line.

The variance of the Y measures from the means of the columns is most readily determined with the use of the correlation ratio *etc.* The square of this ratio is the variance of the

means of the columns from the mean of all the Y measures, multiplied by the number of cases in each column, to the variance of the Y measures from the mean of all the Y measures. The variance of the means of the columns from the mean of all the Y measures is the sum of squares of the deviations of the means of the columns from the mean of all the Y measures, times the number of cases within the columns corresponding to the X measures, divided by the total number of cases. The variance of the Y measures from the means of the columns is the variance of the Y measures from the mean of all the Y measures, minus the square of the correlation ratio, times the variance of the Y measures. The difference between the coefficient of correlation and the correlation ratio is an index of the extent to which the means of the columns departed from the points on the regression line.

In situations in which we desire to determine whether the differences between a set of observed frequencies and a set of theoretical frequencies could be regarded as chance fluctuations, chi square may be calculated to show the probability or proportion of times that as great a divergence as that obtained would occur as a result of chance fluctuations. From the value of chi square and the corresponding degrees of freedom, the proportion of times that the divergence of the observed frequencies from the theoretical frequencies would be exceeded in random samplings of the same size, may be obtained from Elderton's table for testing goodness of fit. As a measure of the divergence of fact from hypothesis, chi square may be used in connection with a contingency table or to test the goodness of fit of a distribution to a normal surface of frequency. It is the sum of the squares of the differences between the observed frequencies and the theoretical frequency at each interval divided by the theoretical frequency. The theoretical frequencies are the proportions of the areas of a normal surface of frequency that corresponds to each $x - x/SD$ distance from the mean on the base line. In the chi square table of Elderton the P corresponding to the chi square and the degrees of freedom ($n=1$) shows in what proportion of cases any value of chi square will be exceeded. The chi square technique is, thus, a means of determining the probability that the two or more distributions of measures used in

an experiment are random samplings of a population. The chi square may be used in testing a group of means for homogeneity or a group of arrays for homogeneity of variance. When capacity tests as well as initial tests of attainment are used, the groups of subjects may be selected to approximate a normal distribution and tested for homogeneity by means of the chi square test.

Before an experiment is set up, it may be important to discover whether the proposed techniques to be compared can produce differences greater than might be found among random samplings of a population. To accomplish this function, analysis of variance has come into use in educational psychology. In samples of the same size drawn from a homogeneous population the mean variance of the samples or columns in a distribution table plus the variance of the means of the samples equals the variance of the total sample and the variance of the means multiplied by the number of cases in a sample equals the mean variance of the samples. Also from N times the variance within the columns divided by $N-k$ degrees of freedom and from kn times the variance between columns divided by $k-1$ degrees of freedom, as well as from N times the total variance divided by $N-1$ degrees of freedom, the variance of the population from which these statistics were derived may be estimated, from the first two independently since they are exclusive. Hence, if the estimated population variance or the mean square obtained by dividing n times the sum of the squares of the deviations of the means from the mean of the total sample by the degrees of freedom ($k-1$), differs from the estimated population variance or the mean square obtained by dividing the sum of the squares of the deviations in the columns from their respective means by the degrees of freedom ($N-k$), to no greater extent when attempts have been made to produce differences in the samples than would occur if the samples were selected at random, the null hypothesis that the samples may have arisen from chance fluctuations in drawing them from a homogeneous population is substantiated and further work of the same kind or quality is not likely to produce significant results.

The comparison of the estimates of the population variance may be made directly from the mean square or estimated population variance

obtained from the squares of the deviations of the measures from the group or column means, divided by the corresponding degrees of freedom ($N-k$); from the mean square or estimated population variance obtained from the squares of the deviations of the means from the mean of all the measures, multiplied by the number in the group, divided by the corresponding degrees of freedom ($k-1$); and also from the mean square obtained from the squares of the deviations of the measures from the mean of all the measures divided by the corresponding degrees of freedom ($N-1$). The ratio obtained by dividing the larger of the two mean squares—mean of the squares within the columns or mean of the squares between the columns—by the smaller may be compared with the values of F in Snedecor's table for the corresponding degrees of freedom to ascertain whether so wide a divergence would occur among random samplings at the one per cent level or even at the 5 per cent level of confidence. The level of confidence may also be found from Fisher's Z -table by setting $z = \frac{1}{2}(2.30258 \log_{10} F)$.

Instead of finding the standard error of a difference in mean gains of an experimental and control group in the usual way, t may be calculated by analysis of variance from the difference between mean gains and the square root of the sum of the squares of the standard errors of the means of the gains in each group, with the estimated SD_M , determined from the mean sum of squares or estimated population variance derived from the variance within columns or F may be calculated from the variance between columns divided by the variance within columns.

When the measures are classified in the columns on the basis of one character and in the rows on the basis of a second character, such as methods in the columns and schools in the rows, with the original selections of experimental groups randomized for both characters, the sum of squares for the rows may be obtained in the same way as for the columns and the sum of squares for both the columns and the rows subtracted from the total sum of squares to obtain the interaction variance or residual sum of squares divided by $(n-1)(n-k)$ degrees of freedom. This is the variance that would be obtained by correcting each column measure by the difference between the

column mean and the mean of all the measures, correcting again each row measure for the difference between the row mean and the mean of all the measures, and then finding the sum of squares for the corrected measures from the mean of all the measures, and dividing by $(n-1)(n-k)$ degrees of freedom. This interaction variance, corresponding to the variance within the columns, is used to test the column variance by finding the ratio of the column variance to the interaction variance, from which the row variance factors have been eliminated, or to test the row variance by finding its ratio to the interaction variance with column variance factors eliminated.

The analysis of variance is not limited to three components but may be extended to a larger number, may include groups of measures within each classification cell, and may, through analysis of covariance, deal directly with the gains as final measures through correction of the final measures for differences in initial measures. These more specialized techniques of analysis of variance as well as those involving the use of the chi square test, partial and multiple correlation, the regression equation, and curve fitting, like those at the basis of mental measurements, could be described in adequate detail only in articles dealing with each. The specialized techniques involved in the development of instruments for the measurement of mental functions are taken up in "Educational Psychology: the role of measurement."

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EMOTION.—The interest in human emotions has captivated the greatest minds throughout the history of psychology. Comprehensive theory on this topic has developed slowly, however, and widespread agreement among experts is rare even today. The following historical survey is designed to maintain a general neutrality so far as contemporary controversies are concerned. As an introduction to such a survey some attempt to define "emotion" seems necessary.

The popular textbook definitions of emotion are quite suggestive but are far from being conclusive. Emotion is by some considered to be a stirred-up state of the organism. Others define emotions as emergency reactions. But such definitions neglect a certain difficulty which arises from the fact that both physiological disturbance and situational crisis are matters of degree. At what point does truly emotional behavior commence? Does all behavior have an emotional component? Some psychologists, both ancient and modern, have accepted the thesis that every experience has an affective aspect, and all definite adjustments by the organism include an emotional component. If this thesis is true then obviously the above definitions miss the point. Shall "emotion" remain as an undefined but absolutely basic category?

Behavior in which a great surplus of organic tension, over and above that which is obviously necessary and useful for adjustment, is evident admittedly is somewhat rare. Likewise, those experiences in which affective qualities dominate the field are unusual experiences. And some psychologists would reserve the term "emotional" for these extreme cases. And there are certain gross physiological criteria of the emotional state which fit these extreme cases. For example, animal psychologists regard such behavior as otherwise unexplained defecation and urination to be a sign of emotion or, perhaps, even a component of the emotional state. When more subtle physiological criteria, such as cardio-vascular changes, are used, it becomes difficult to define the limits of an emotional state. In the study of highly complex, socialized human behavior emotion is usually defined in very broad terms. Some would urge even that, wherever concern is expressed, there is emotion. It has been said that in the expression of all attitudes, even in those cases in which the expressive action is of a subtle, symbolic type, emotion is evident. To evince an attitude pro or con any issue is to be other than unconcerned, other than neutral, and some psychologists define emotion thus broadly.

Historically, no speculative interest may be traced to epochs more remote in time than those to which the interest in emotion has been traced. The pre-Socratic philosophers showed such an interest. Empedocles, for example, taught that love and hate are cosmic driving

forces. The Platonic Eros and the Pauline Caritas are famous. Saint Augustine tended to identify the emotion of bliss with the third person of the Christian Trinity. Pagan and Christian, Stoic and Epicurean, all agreed that the good life is characterized by certain types of emotions, although there was some dispute as to just which types were ideal. The condition of abiding happiness was sought by all.

Descartes (1596-1650) wrote the first important treatise on emotion in the modern epoch. This treatise, *The Passions of the Soul*, attempted to classify the emotions. Descartes advanced the thesis that there are six "primary passions": wonder, love, hate, desire, joy and sadness. Sadness and hatred were conceived as being natural consequences of pain, while joy and love were felt to be natural consequences of pleasure. Descartes argued that continued pleasure generates joy, and that the recognition of the source of this affirmative emotion results in a feeling of love toward the object. Desire to maintain access to the same object emerges later, especially if the relationship in which pleasure had been produced is temporarily threatened. The Cartesian analysis of the negative emotions followed a strictly complementary logic: pain corresponding to pleasure, sadness to joy, hatred to love and negative desire to positive desire. Wonder was placed in a unique class by Descartes, who urged that when emotional consequences much exceed the apparent causes, wonder at the situation is a natural consequence. It was supposed that the limited cognitive perspectives, available to finite minds, result in a condition in which the emotion of wonder must be considered quite normal.

In the centuries which were dominated by the Cartesian rationalism, and in later centuries during which the Romantic movement developed its protest against excessive rationalism, many classifications of the emotions were constructed, and many controversies about the relative worth of emotion versus reason had their day. Such great names as Spinoza and Kant, in philosophy, Rousseau, in literature and educational theory, and, in psychology, Herbart and even Wundt, are identified with classificatory efforts, evaluative efforts, or with both those types of effort in this field. Wundt, who was the chief founder of experimental psychology in the late nineteenth century, nevertheless

assumed a mainly classificatory attitude toward the problems of feeling and emotion, and introduced no revolution in the field. His attempt to classify the feelings in dimensional terms, based on the concepts of pleasantness-unpleasantness, excitement-calm and tension-relaxation, simply represented the culminating point in the logic of classification.

One of the great contemporary controversies concerning emotion sprang from the famous James-Lange formulation. In 1886 the American psychologist Wm. James stated a really revolutionary theory of emotions, and a very similar, but equally original, statement was advanced in 1887 by Lange, the Danish physiologist. Roughly expressed, these theories assert that emotional experience consists chiefly of internal, or organic sensations. Emotion is identified with sensory states having an exclusively organic origin, although their introspective reference may be identified with the external, stimulating circumstance. James stressed changes in the major viscera and, to a lesser extent, he stressed the skeletal components. Lange stressed various vasomotor changes. But, regardless of minor differences in judgment, it soon became clear that henceforth emotion was to be investigated in a very broad psychophysical frame of reference.

After his original statement, Wm. James indulged in a lively polemical effort in support of the theory. At times he argued that subjective emotion may lag temporally behind the bodily adjustments. His view has been caricatured by the saying that one does not run because one is afraid, but rather one experiences fear because one has started running. Yet James did not identify emotion with sensations coming from the skeletal muscles nearly so much as such a caricature might seem to indicate. As noted above, visceral responses received his chief attention. He did, however, tend to account for moods in terms of postural sets.

The most serious attack against the whole James-Lange position came on the neurological front. This attack was spearheaded by the work of W. B. Cannon, an American physiologist who published a series of research reports in the second and third decades of the twentieth century. Many of these were summarized in his book titled *Bodily Changes in Pain, Hunger, Fear and Rage*. The James-Lange theory would have made it necessary to assume that certain

cortical, sensory areas are the direct, neural substrata of emotional experience. But Cannon stressed the rôle of the thalamus and other sub-cortical centers. Certain of his experiments upon infra-human organisms tended to prove that emotional behavior is changed but slightly when afferent links between viscera and brain are severed. Other experiments showed that when parts are extirpated from various sub-cortical regions, the organism's emotional capacities are radically changed. In some cases the removal of the posterior half of the thalamus was associated with the obliteration of most, or all, of the familiar patterns of emotional behavior.

Cannon admitted that cortical factors do play some part in the more complex emotional states. The cortex was thought to inhibit response tendencies based on lower levels. It was thought to modify or reinforce such tendencies in certain cases. But Cannon and his followers have done less than justice to the James-Lange position. Supposing the thalamus to be intact, it might be assumed that in certain cases visceral changes give rise to cortical disturbances which, secondarily, activate those sub-cortical actions which Cannon stressed. Furthermore, such a sequence of events or its reverse, might be modifiable in a variety of ways by the use of conditioned response techniques. Thus the physiological substratum of emotional experience one day may be defined in much more many-sided and dynamical terms than either the James-Lange theory or the Cannon theory is able to provide. Provisionally, both those theories may be thought of as having contributed something toward the understanding of the physiological aspects of emotional actions.

Much recent research in physiology and psychiatry has confirmed the familiar belief that the autonomic nervous system and the ductless glands play important parts in emotional responses. The autonomic system includes those neural groups which are located completely outside the brain and spinal cord. Autonomic ganglia operate with partial independence from the central system. They compose a somewhat self-regulative system which may be divided roughly into two chief functional parts, the sympathetic division and the cranio-sacral division. Between these a partial functional antagonism prevails. One division provides enervations which retard the visceral processes that

the other division tends to accelerate. In the vasomotor responses the same negative reciprocity has been observed. In a manner of speaking, the sympathetic group is dominant during emotional states and the cranio-sacral, or parasympathetic, system is dominant when the organism is relatively quiescent in regard to outer behavior. Speeding of the heart, slowing of alimentary processes, accelerated respiration, increased perspiration, pupillary dilation and those vascular responses which tend to concentrate blood supply in the skeletal muscles, are among the changes which indicate dominance by the sympathetic. This elementary account, of course, involves great over-simplification. In lust the sacral and the sympathetic segments exercise a mutual reinforcement in some regions, but antagonistic action in other body regions. Some psychopathologists believe that many neuroses and some psychoses are caused by a malconditioning of autonomic responses.

Endocrinology supplements neurology in the modern, physiological approach. The most familiar endocrinological influence in emotional responses is that of the adrenal glands. When the sympathetic system is in a high state of excitation adrenal action reinforces its dominance. Unusual amounts of adrenalin are projected into the blood stream and the release of blood sugar from the liver is facilitated, thus making available more energy for muscular use. The gonads, or sex glands, function as ductless, endocrine glands which regulate individual development and action, as well as functioning as duct glands for reproductive purposes. Among other things, the gonads play some part in the maturation of the organism's capacity for sex behavior and sex emotion, and it should not be forgotten that certain other emotions are in part sublimations of sex emotion. The adrenal glands and the pituitary gland play a part in the development of the gonads, and, as a matter of fact, the reciprocal action of these and other endocrine glands is being increasingly stressed. Few endocrine influences of importance to psychology can be identified with the isolated functioning of any one ductless gland. For example, to suppose that emotional apathy would necessarily be caused by hypothyroidism would be considered a fallacy today. Some hypothyroidal individuals are hyperactive and very excitable, while not all

hyperthyroidal persons are highly excitable. Varying influences of other glands and of non-glandular factors make any generalization, based on the condition of any one gland, exceedingly dangerous. Interdependence within the endocrine system and between it and other systems is regarded as the rule in all contemporary diagnostic work.

Contemporary psychology of emotions has by no means become a mere branch of physiology, although the importance of the physiological approach as one approach among many is universally recognized. William McDougall was one recent investigator who was interested only secondarily in physiology. This British psychologist, whose voluminous writings in this field were mostly published in the 1920's and 1930's, was interested in correlating emotions with other aspects of behavior. He had been the one who originally defined psychology as the science of behavior, but his intention in so doing was very different from that evinced by the doctrinaire mechanistic objectivists. McDougall did not intend to surrender to philosophical phenomenology all the manifold data of the subjective sphere. Rather, his program for modern psychology included respect for every type of data which might throw light on the dynamics of actual behavior. In this programmatic position he has been seconded by such American psychologists as Woodworth of Columbia, and by some American followers of the Gestalt school, which originally was a German monopoly.

In his *The Organization of the Affective Life*, McDougall stated that every driving motive, whether it be a largely innate propensity, or a learned tendency, has a specifically affective component, along with a cognitive component and a conative component. For example, associated with the sex drive is the emotion of lust, and associated with combat action is the emotion of anger. The emotional components are reported by human introspectionists, and in the behavior of lower organisms the emotional components are expressed by certain parts of the total goal-directed action. For example, escape activity does not in its moderate forms strongly express fear but escape activity augmented by profound visceral changes, and associated with such phenomena as pupillary dilation and certain characteristic vocalizations would express fear. McDougall has inferred

that the affective component is present whenever striving occurs, but that this component is greatly intensified if the goal seems unattainable or difficult to attain. Thus all escape action would involve a component of fear, but the so-called narrow escapes would involve the most intense fear. Besides the affects which are bound to particular types of conation, McDougall believed that there are certain more generalized affects. For example, elation accompanies successful strivings of many types, especially if the goal is being achieved despite opposition. Similarly, depressed feelings may accompany progressive failure in many spheres of endeavor.

Finally, the McDougallian theory of sentiments presents a doctrine of affective development which conceives of it as proceeding in relationships of correlation and reciprocity with cognitive development and conative development. In the sentiment, many motives which originally were not specific in respect to their objects function together with reference to a specific object. For example, a man's familial sentiment may include love for his home, fear concerning certain menaces to it, anger toward those believed responsible for the existence of menacing conditions, and so forth. The sentiments integrate the unconditioned propensities, inhibit some of them in certain contexts, reinforce certain of them in various contexts and in other ways represent a long process of socialization and intellectualization. Sentiments, once formed, may themselves be integrated in complex relationships of mutual reinforcement, selective inhibition, and so forth, and the total system of sentiments constitutes a hierarchy in which the sentiment of self-regard may be the dominant hierarch.

The Depth Psychologists who interpret emotions as expressions of unconscious motives have based their theories upon clinical data. Their major contribution is in the pathology of emotional behavior. Thus they have attempted to prove that many phobias, or irrational fears, are caused by repressed memories of traumatic incidents or of socially "shameful" incidents. They have studied the transference of affects from one object to other objects. Freud has asserted that affective attitudes are sometimes disguised to the conscious mind by reversal formations. Thus, for example, a conscious atti-

tude of hate might represent an unconscious attitude of love toward the same object. Also such an attitude as that expressed by the formula "I love X" might disguise a true attitude of hate for X, and a further step in disguise would be for me to assume that another formula is true, namely, the formula "X loves me," and to assert this while denying my basic attitude and also denying the first step in its disguise. In some cases the depth psychologists have presented interesting data to prove that such transformations and retransformations occur, but many psychologists believe that processes of that nature are too often hypothesized *ad hoc* in order to defend a doctrine or to confuse the more naive disputants against some doctrine. Nietzsche, and before him Novalis and Schopenhauer, formulated many of the psychodynamic principles which the Freudians have applied, or misapplied, to so many situations involving psychological or social conflict.

One of the most fruitful contributions to the psychology of emotions was made by Carl G. Jung, the founder of Analytical Psychology. Jung formulated the theory of the psychological complex, and not only has this theory been applied by Analytical Psychologists in their clinical work, but also other depth psychologists have developed modifications of it, and have applied it in various modified forms. Freudians, Adlerians and others made the theory of the complex a point of departure from which they were to reach some novel and important conceptions concerning human personality. Jung thought of the complex as a group of latent ideas, or other response tendencies, linked together by common emotional associations, and tracing back to common experiential antecedents in the life history. (The article titled Jung, Carl G. provides fuller information about Jung's conception of the complex, and about his methods for probing complexes.) The famous Freudian theory of the Oedipus complex and Adler's theory of the inferiority complex applied this basic idea to what those psychopathologists believed to be some common, and perhaps universal, personality patterns.

Janet, the French clinician and academic psychologist who, like Freud, was once a student of Charcot, originated the contemporary stress upon the rôle in psychopathy of self-directed emotions. Janet also stressed the idea

that physical disease, as well as traumatic experiences, may, temporarily or permanently, render the organism incapable of maintaining the more complex, rational associations. The organism, thus hampered, Janet argued, may be dominated in behavior by primitive, highly affective associations, or may behave in a dissociated manner as is characteristic of persons suffering from hysteria. Freud's book titled *The Problem of Anxiety* applies the conception of self-directed emotions in some extremely subtle and highly speculative analyses of clinical material. Eugen Bleuler was another European psychopathologist who placed great stress upon affective factors. He used the term "autistic thinking" to designate emotionally and wishfully directed sequences of ideas. Bleuler also made great use of "ambivalence" as a descriptive category. (The individual's feelings are said to be ambivalent if contradictory affective attitudes are assumed toward a single object.) Another term, made popular by Bleuler, was the term "schizophrenia." Since the 1920's this term has gradually replaced "dementia praecox" as the name for certain psychoses of regression. Bleuler's clinical studies of these conditions emphasized the importance of affective factors. Coriat stated that the feeling of unreality and the feeling of depersonalization are the definitive attributes of the schizophrenic process. (The articles on clinical and abnormal psychology, the autonomic nervous system, and related topics, throw additional light on the rôle of affective factors in psychopathy.)

John B. Watson and other American Behaviorists stated many fundamental questions in the psychology of emotions. Working at Johns Hopkins University, Watson studied emotional behavior in human infants, attempted to define the genetically primary emotions, and proved that emotional responses may be "conditioned." His views enjoyed an extraordinary vogue in the second and third decades of the present century, and for a time Watson was considered by many to be perhaps the leading American psychologist. Sometimes the major behavioristic thesis is stated in somewhat extreme form as follows: "Any response which an organism can make is conditionable to any stimulus which can affect that organism's receptor organs." Behaviorists tend to view learning as a recombination of pre-existent elements of response,

and tend to regard conditioning by contiguous presentation of stimuli to be the sole possible cause of learning.

John B. Watson stated that there are three genetically primary emotions, namely, fear, rage and love. Each emotional response was said to consist of definite motor acts, different in each of the three cases. Each primary emotional response was said to be evoked only by one or two unconditioned stimuli. Other stimuli were said to become efficacious through processes of conditioning the primary responses.

These views, admirable for their definiteness, have been criticized in various ways. First, it was reported (by Sherman and others) that trained observers were unable, when applying Watsonian criteria, to differentiate the rage response from the fear response, or either from the response to pain, if they were allowed to observe infants respond under conditions in which they could not perceive the stimulus in operation, nor perceive the total context of the behavior. Second, various investigators demonstrated that the fear response, even if originally it is stimulated only by loud noises or by loss of bodily support, nonetheless may more easily be conditioned to some new stimuli than to certain other new stimuli. (For example, animals more easily become objects of fear than do inert objects.) Third, it was found (by Wm. Stern and others) that other stimuli than those mentioned by Watson, and in fact almost any sudden, intense stimulus and, later on, any radical surprise may produce that catching of the breath, eyelid closing, vocalization, etc., which Watson has identified as the fear response. Fourth, the genetic question as to whether the only native responses are those present in earliest infancy was raised, and certain components of sexual behavior were cited as constituting one possible exception among many. Fifth, although it was admitted that an original response may be conditioned to a new stimulus by simultaneously presenting the original with the conditioned stimulus several times, the question was raised whether similarity between stimulus patterns may not secure transference, and whether association by similarity is not more important than association by contiguity. Sixth, it was asked (by Gestalt psychologists) whether in the more complex affective behavior may be found the same ele-

ments which occur in simpler behavior, or whether on the contrary entirely new elements are added and all the old elements are transformed. Seventh, it was asked how the reflex theory could be applied to individual differences in average affective tone, and to the more enduring personal moods.

To John B. Watson belongs the great honor of having initiated that at once objective and genetic approach to emotional behavior which has dominated so much fruitful research in the contemporary period. Many of the most serious criticisms of Watson's own specific statements presuppose the use of methods similar to his method. American investigators like Sherman were the first to criticize his theory from the objective and genetic viewpoint. Early emotional behavior, observed Sherman, is diffuse and general in character and does not reveal highly differentiated fear, rage and love patterns. Stratton, another American investigator, stated that excitement is the genetically primordial human emotion. He also pointed out that in the adult diffuse excitement often precedes or follows after the more specific affective responses.

A systematic genetic theory has been stated by Bridges, who accepts and elaborates upon Stratton's general position. Bridges observed emotional behavior of infants and children during and after the nursery-school period. She found that the primary emotional responses may be characterized no more specifically than as follows: first, there is neutral excitement; second, in certain circumstances excitement is tinged with delight; and third, in other, specified circumstances there is distressed excitement. Stimuli which later might produce definite fear or rage responses, at first produce only a distressed excitement which may be differentiated from excitement with delight, but not from certain responses to stimuli which adults define as producing pain. Maturation and learning lead to the progressive differentiation of emotional behavior. From delight emerges affection directed toward various objects, and from distress emerges object-directed anger, fear and disgust.

Bridges regards emotional development as a component part of social development. The socially mature individual has a wider repertoire of emotional responses than the less

mature individual shows. Socialization involves the progressive differentiation of emotional patterns, and the acquisition of conventionalized modes of emotional expression.

American psychologists are now investigating various specific affective action patterns. Only a few examples may be given. In the late 1930's Landis and Hunt investigated the familiar startle-pattern in great detail, observing both human and infra-human subjects. This pattern includes bending the knees, leaning forward, abduction and pronation of the upper arms, clenching the fists, closing the eyes, and other changes. Violent stimulation produces the patterned-responses, and Landis and Hunt found that expectancy may modify the action but not entirely eliminate it. They found that a similar pattern, but if anything a more complex one, appears in the behavior of the higher sub-human mammals. Strangely enough, the startle-pattern seems to be less variable in man than in other organisms. Important individual differences, and variables related to the different types of stimulation were discovered. Landis and Hunt measured many aspects of this action pattern with great accuracy. They used an ultra rapid motion picture camera to make their observations of temporal factors more precise. This work may be taken as typical of a certain class of investigation which has become popular in the United States. The literature includes accounts of somewhat similar studies of affective action patterns connected with sex situations, connected with situations in which disgust is evoked, connected with laughter-evoking situations, and many other types.

Among the more promising work should be mentioned Lund's study of weeping. This American investigator found that weeping by human adults usually occurs in complex, social stimulus-situations. Weeping is not characteristic of deep depression such as is found in certain psychotic states. Nor does unalloyed grief usually include weeping behavior. Grief alleviated by sentimental reminiscences, pity alleviated by some encouraging factors, or tragedy which includes an aspect of comedy may evoke weeping. This study indicates that, like laughter itself, weeping is most likely to occur in situations having some contradictory or incongruous aspect. A comparative study of weeping and laughter might have an important outcome

for theoretical advancement in this general field. Lund is to be commended for stressing in his research the more complex levels of affective action. At these levels individual psychology and social psychology most clearly interpenetrate.

Helge Lundholm's recent book on the psychology of art titled *The Aesthetic Sentiment* is an important theoretical statement in the psychology of affective evaluation. Lundholm points out that in the fine arts a "taste for affect gain" is indulged and cultivated both by the artist and by the appreciative spectator. He points out that many other activities by men under conditions of civilization are motivated partly by a desire to attain emotional tension rather than by a desire to achieve any practical goal or any immediate release of tension. He describes some affective responses which may be evoked by isolated parts of the esthetic object, and discusses the relationships between the various parts. In most meaningful paintings, he urges, one object is the dominant center of attention and empathic feeling, and this dominant object provides the clue to the emotion which must pervade any harmonious experience of the totality. Affects evoked by subordinated parts reinforce or harmoniously counterbalance the feeling which the dominant object evokes. That some esthetic values are based upon the release of repressed impulses is admitted, but a psychoanalytic theory of esthetic value is ridiculed as being naive because one-sided. Certain geometric and logical categories are found to be involved in the esthetic judgment along with affective factors. Specifically esthetic emotions are interpreted with reference to the formal characteristics, but it is shown that the formal characteristics must be experienced in a particular way if esthetic value is to be realized. The esthetic sentiment is therefore considered to be a highly complex capacity for a certain type of experience within certain supporting situations. The sentiment has a variety of roots in genetically primary human nature, but many aspects of the mature sentiment are acquired through experience and practice, and Lundholm admits that there are important cultural variations. This systematic statement in the psychology of esthetics by the present chairman of the Duke University department of psychology may be regarded as a sample of the

kind of task psychology must undertake if it is to achieve in larger measure that broad, humane usefulness which its greatest devotees have always hoped it might one day realize.

Temperament is a major aspect of personality, and is a major category of the psychology of emotion. For some psychologists it is a descriptive category, and for others it is inferential. A person's temperament might be defined as the average quality of his emotional experience or emotional expression. But it might be defined rather as a generalized affective set in the personality as it is known through making inferences from the behavioral data. The two viewpoints concerning temperament could be combined by the hypothesis that the characteristic affective set of a person, although it is complex and may be partly self-contradictory, nevertheless is usually evinced by a characteristic personal mood which in turn is expressed in the constant aspects of the individual's affective behavior. Philosophically inclined psychologists, like Felix Krueger and William Stern, have insisted that all mental processes operate within an affective matrix. If this matrix is unique to the individual, then it would be his characteristic personal mood. Such a mood would be the most constant manifestation of his temperament, while the more fleeting affects would also express the temperament in so far as they are uniquely characteristic to the particular individual. Far from regarding all emotion as a form of disturbance, writers like Krueger and Stern consider the object-directed cognitions as being disturbances upon or within a totality which is essentially emotive in character, or which may be called "affective" if the term "emotive" is to be reserved for application of those very intense affective phenomena which have only a short duration. This viewpoint is reinforced by the fact that some experiences are entirely affective. For example, there are no salient cognitive elements in the state of intense ecstasy. Possibly in certain states of extreme motorial quiescence the affective aspects also monopolize the field.

Few American psychologists view temperament in this light. Although the term is commonly used to stand for the affective aspect of the total personality, this aspect would be considered by most American psychologists to be a system of native and acquired capacities for

affective responses. Such a system might become thoroughly fixed and difficult to modify even though it were highly inconsistent. Emotional fickleness might become an enduring trait of the personality. Radical shifting of moods might be the usual thing. Most American psychologists believe that temperament is the outcome of processes, and conditions future processes. Emotion-provoking situations induce the formation of habitual affective response-tendencies. The prior structure of the individual, however, determines what affective response will be elicited by a particular situation. That there are characteristic personal moods in well-integrated personalities none would deny. These moods might be primarily determined by idiosyncrasies of native structure, or might be determined primarily by very much generalized habits of affective response.

A. N. Whitehead, the famous contemporary philosopher, accepts the thesis that emotion is a universal and necessary factor in experience. Each occasion of experiencing involves, Whitehead states, integrating data into an emotionally satisfying pattern. In the phenomenological part of William James' system of psychology, a very similar position was taken. Feelings were said to express tentative groping toward more definite cognitive associations. Feelings were said to be the transitive factors in the stream of consciousness. Neither James nor Whitehead seemed to realize that long-range personal moods express evaluational orientations. The type of patterns which are achieved in any life experience and also characteristic failures to achieve pattern must have profound consequences for the development of a personal temperament and the characteristic personal moods.

Social psychology is only now realizing the importance of affective factors as expressions of culture and its evolution. Much research along this line may be predicted for the immediate future of social psychology. Emotional behavior in animals is always oriented toward momentary situations. Human emotions, on the other hand, sometimes presuppose relatively enduring schemata of social values. Animal rage appears in particular rivalry-situations, but enduring human hatreds must be explained in trans-situational terms. Some hatreds and jealousies express human rivalry in the en-

deavor to achieve higher social status. There is also a status-referent pride and admiration, shame and disgust, comedy and tragedy. Classical Greek tragedy could never have been appreciated emotionally by the members of primitive, communistic tribes. And what was tragic for Greek pagans might be almost comic, in some cases, for Christians in the Apostolic age. Worldly criteria of status gradually gave way to supernatural criteria. When an individual realizes that perhaps any existent criterion of status is merely provisional, his major social emotions will no longer be status-referent but may become history-referent or, if his attitude is activist, they may become quest-referent. In any moment of social history some hierarchy of values must be dominant if social confusion is to be avoided and cooperative work is to continue. But there is an evolution of evaluative attitudes and, as Nietzsche pointed out, there may be occasional rapid "transvaluations of values." Social psychology should thoroughly investigate the status-referent emotions, their emergence from the merely situational passions, and their modification through later, social and technological crisis situations. (See the article on Social Psychology.)

Today, as ever, happiness, the most universal affective value, is the chief practical concern of those who are interested in understanding emotions and the laws of affective action. The problem of the social and technological conditions which could make personal happiness be more general, deep and secure is fundamental for any integral applied psychology. This problem sooner or later emerges in discussions of the psychology of education, the psychology of industrial relations, the psychology of values, the psychology of religion and other branches. In the light of its findings concerning the affective life modern psychology must contribute to the criticism and evolution of social systems, ideologies dominating cultural groups, work procedure and personal philosophies of life and programs of daily living. Modern psychology today has mastered through a prodigious amount of research and theorizing many facts and principles related to affective processes. And while further investigation of particular, specialized problems is continuing, the greatest contemporary need seems to be the shaping of all this material into a comprehensive system in

terms of which practical programs for its application in the human quest for happiness may be worked out.

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EXPERIMENTAL PSYCHOANALYSIS.—Experimental psychoanalysis exists only as a body of results from psychological experiments and objective investigations which have been instigated by psychoanalytic theory or which, by sheer chance, are relevant to psychoanalytic generalizations.

As a branch of science, psychoanalysis consists of a method of observation, a body of generalizations about personality development, and, intertwined with these generalizations, a body of motivational theory. Although psychoanalysis is the only approach to date which has provided a way of viewing behavior and the life history of individuals in broad perspective, as a scientific method it is unsatisfying to those

who judge it by the standards of physical science. The free-associations and dreams which constitute its raw data form a voluminous verbiage almost impossible to record and to make available for the inspection of others besides the particular psychoanalyst listening. The inductions from such data can be colored to an unknown degree by personal predilections; they lack the objective and interpersonal checks taken for granted in other branches of science. Moreover, since the subjects of psychoanalysis are adults, the interpretations of their behavior in terms of their personal histories are explanations after the fact. They cannot be predictive. The fact that psychoanalysis has dealt with aspects of personality development and operations which other scientific approaches had ignored and uncovered challenging results of great significance, has, therefore, made objective and experimental tests of these results important.

The relevant experimental and objective investigations have nearly all been done during the last twenty years, and a majority during the last ten. These studies may be grouped around the psychoanalytic topics to which they are directed or to which they happen to be relevant: the etiological importance of conflict, psychosexual development, description of personality patterns, fixation and regression, the dynamisms and dreams. The brief survey given here must necessarily be incomplete; only outlines of the evidence can be given.¹

THE ETIOLOGICAL IMPORTANCE OF CONFLICT

Although Freud's studies of "*The psychopathology of everyday life*" indicated that conflict between impulses is commonly to be found in normal individuals, he stated categorically that "there is no neurosis without such conflict" (1920, p. 305). Furthermore, he pointed out that there are no specific experiential causes of nervous disorder. The question of whether conflict finds a healthy solution or leads to neurotic symptoms depends upon quantitative considera-

tions, that is, upon the relative strengths of the impulses involved.

This is an explanation after the fact, but the conditioning approach to the production of experimental neuroses in animals, originally developed by Pavlov quite independently of Freud's theory, constitutes at least a partially relevant confirmation. Forcing animals to make difficult discriminations, and other variations of method, have produced behavioral changes in sheep, dogs, and pigs which resemble the neurotic phenomena in human beings. The symptoms include loss of the discrimination, changes from approach to avoidance of the experimental situation, from friendliness to hostility toward the experimenter, cardiovascular symptoms, and pathological sexual reactions. These symptoms, however, have varied according to the animal, the species and the situation (see Liddell, 1944). In the Pavlovian theory of these effects, conflict appears only as the interference between excitation and inhibition. These generalized systems of response tendency are conceptually very different from the instinctual impulses envisaged in the dynamic and subjective approach to psychoanalysis. Liddell's theory of etiology emphasizes the self-imposed restraint to which the animals are submitted in the conditioning situation. This coupled with the monotonous repetition of a specific pattern of stimulation involving what Liddell considers the trivial but inevitable reinforcement, are conceived to produce the experimental disorders.

Masserman (1943) has criticized the conditioned reflex conceptions of behavior and experimental neurosis, and argued for the significance of motivational conflict. Moreover, he has succeeded in producing behavior disorders in cats experimentally by pitting the hunger drive against anxiety drives produced by a sudden puff of air as the animals start to open the food box. Symptoms in and out of the experimental situation like trembling, restlessness, crouching ("anxiety"), persistent non-adjustive reactions ("fixations"), and avoidance of the food-box ("phobias") were actually exacerbated by increasing the hunger drive, or forcing the animals nearer to the food box. Masserman has made a good theoretical case for motivational conflict in the experimental neuroses produced by the conditioning approach. His own experiments were

¹ For a more complete account, the reader should consult the excellent and more ample reviews by R. R. Sears (1943, 1944) to which this résumé is greatly indebted. Only occasional studies not included by Sears will be shown in the bibliography of this paper. These are indicated by a date after the author's name.

planned explicitly to test psychoanalytic theory, and they supported it.

Recently a program of research designed to determine the quantitative laws of conflict objectively has been initiated by Miller (1944) and his collaborators. No attempt is made to produce disorders. Instead of the subjective approach where the conflicting forces appear as "intentions," "wishes," "urges," and "needs," Miller deals with "response tendencies" the strengths of which are controlled experimentally by way of number of reinforcements, number of hours without food, strength of shock, etc. Animals and children have served as subjects. The results show that the issues of conflict are indeed a quantitative matter as Freud had discerned from the subjective approach of psychoanalysis.

PSYCHOSEXUAL DEVELOPMENT

One of the unique contributions of Freud is his theory and description of personality development. In a sense the free associations and dreams of psychoanalytic method yield data from which can be reconstructed a subjective account of the experiences and conflicts which have resulted in the adult personality structure and symptoms of patients (see French, 1944). These data have been interpreted so as to yield a theory of motivation (erotogenesis), a course of development considered universally human, and a wealth of hypotheses about the experiential sources or personal traits, of the perversions, and of various symptoms of disorder. Objective data relevant to these aspects of the psychoanalytic theory of psychosexual development come from objective studies of child behavior, from life history questionnaire or interview studies, and occasionally from laboratory experiments.

Infantile Sexuality. Basic for Freud's theory of psychosexual development is his libido theory. When he set this forth in the second of his *Three Contributions to the Theory of Sex*, he postulated that the sex drive (libido) is the source of the energy for all positive affectional attachments (cathexis), and also that the impulse to behave sexually is present in the child from birth.

Freud stated that attachment to, or love of, objects (cathexis) always results from gratification of libidinal needs by an external object or

person. Laboratory studies, to be reviewed under the heading of fixation, have shown that experiences of success in children, food reward in animals and adult human beings, and identification with heroes in stories will all produce something akin to positive attachments. Furthermore, experiences of failure in children and electrical shock have produced something akin to negative attachments, avoidance responses or possibly hate. While these studies confirm Freud's conception of the role of gratification and its converse in the formation of attachments, they also contradict his generalization that the energy for them must come from the sex drive, unless, of course, all gratification be considered to have a sexual component.

Although there is abundant objective evidence that a sexual impulse or drive is present in very young children, the details of Freud's description of infantile sexuality must be considered. According to his description, infantile sexual manifestations have three characteristics (1920, p. 587). They originate in connection with the biological functions important for life. They are autoerotic in the sense that they have no external object. The sexual aim, gratification, is under the control of the *erogenous-zone*. The oral, the anal, and then the genital zone are progressively dominant. From the facts of sexual aberrations, he argued that the similarities in the kinds of behavior oriented toward these zones were too great for chance, and therefore the sensations arising from their separate stimulation must be fundamentally similar, and thus gratification from one zone could substitute for that of another. The curiosity of children, he described as directed primarily toward such topics as the origin of babies and anatomical sex differences. Freud also described children as unable to accept anatomical sex differences, and as universally shocked by their observations. He described masturbation in three phases, the first during the nursing period followed by a cessation, a second, pre-Oedipal, at about the fourth year followed by another cessation, effected by the castration complex, that lasts until puberty when a third outbreak occurs.

The objective data on oral manifestations are not relevant, of course, to Freud's claim that the sensations arising from this zone are similar to

those arising from the genital zone. Nevertheless, certain of the observations concerned with thumb-sucking, which was Freud's paradigm for an infantile sexual manifestation, corroborate his descriptive points. Non-rewarded sucking and mouthing at the nipple has been observed in young children after eating by Halverson and by Jensen, which argues that it is motivated by something besides hunger. Levy's studies of thumb-sucking in children indicated to him that it results from inadequate opportunities for sucking during the regular feeding process, and they led him to postulate a separate oral need for sucking. Observations by Ribble (1944) have supported this conclusion. Levy also found that a pair of pups fed with a large-holed nipple showed the effects of their sucking deprivation by chewing and sucking each other's bodies between meals, and by being far more responsive to a proffered finger between meals than were their litter-mates left with the bitch or bottle-fed through nipples with small holes. The fact that children are temporarily quieted by non-rewarded sucking when hungry argues that it may have some substitutive value for food, but says nothing about the substitutive value of oral gratification for excitement from the anal and genital areas. Interference with sucking behavior produces frustration effects similar to those produced by interfering with other drives.

Freud was apparently led to assume an erotic characteristic of anal sensations by his clinical observation of a correlation between constipation or bowel disorders in childhood and adult nervousness, by the existence of anal perversions, and by psychoanalytic evidence that the anal zone often retains considerable genital irritability for life. In a study of 46 nursery children, which again is irrelevant to the claim of similar sensations, Koch found a low but statistically significant correlation between a measure of constipation secured from parents and the frequency of nervous gestures. If adult nervousness and the frequency of nervous gestures in children be considered equivalents, Koch's study supports the clinically observed correlation. But Koch argued that such emotions as fear and anger reduce gastrointestinal motility and may at the same time eventuate in nervous gestures, a plausible interpretation quite different from that in libido theory.

The writer knows of no controlled objective

evidence relevant to the theory of progressive dominance of the oral, anal, and genital zones, but genital excitability, as indicated by erections in male babies, exists at birth. A possible learned basis for the subjective associations between excitement arising in the three zones found in psychoanalytic data derives from the study by Halverson. He observed the daily occurrence of tumescence in nine male babies varying in age from three to twenty weeks. He found it usually accompanied by restlessness, stretching, or crying from which unpleasantness may be inferred. Furthermore, it was associated with micturition, defecation, with hampered feeding, and also occasionally with thumb-sucking. Halverson argues with evidence that tumescence resulted from bladder pressure, but the simultaneous occurrence of these oral, anal, and genital stimulations might account for later association of the sensations from these areas and thus explain what Freud saw in his subjective data without implying any such innate unity as he assumed. Halverson found detumescence commonly followed by playful behavior or relaxation, from which pleasantness may be inferred, but evidence of "orgasm" quality is lacking.

Observations by Isaacs and others show that oral, anal, and genital impulses frequently get verbalized in social situations with other children and with adults, and that all are accompanied by giggling, defiant aggressiveness and other signs of embarrassment and guilt. These observations fit descriptively Freud's notion of the polymorphous-perverse disposition. The response tendencies are present. But the fact that they are all a source of guilt indicates nothing about their interrelationship other than that they have all been forbidden. On the other hand, the fact that Hamilton found a large percentage of the 200 normal adults in his study of marriage who recalled having felt such polymorphous impulses as anal erotism (34%), urethral erotism (37%), childhood exhibitionism (53%), voyeurism (89%), narcissism (64%) argues strongly for the common existence of the "polymorphous-perverse" impulses.

Observations by Isaacs and the information secured from mothers about their children's questions by Hattendorf confirm Freud's claim that the commonest question of young children concerns the origin of babies, with physical sex

differences next most common. On the other hand, Hattendorf's data indicate that a majority of children between two and five years of age do recognize the anatomical differences in genitalia, which contradicts Freud's claim that they are generally unable to accept these. In a study of children's emotional attitudes toward anatomical sex differences with a play technique, Conn found the majority showing a lack of emotional reaction, but 17 of 50 were disturbed and they worried about the cause. A literal castration complex appears to be far from universal. Studies by Terman and by Landis, *et al.* have shown that a majority of adults consider their childhood sex information inadequate. These data argue that Freud's description of childhood curiosity about sex is true to a considerable degree but his contention of universality constitutes an overgeneralization.

All the aspects of Freud's theory of three separate occurrences of masturbation cannot be tested by objective evidence. However, infantile masturbation or manual manipulation of the genitals has been shown to be common in boys, but not necessarily universal. When Levy questioned the mothers of 49 boys, the mothers of 26 admitted observing masturbation before their sons were three, and 19 admitted observing it during the first 18 months. As Freud stated, manual manipulation of genitals is more common in boys than in girls. In Levy's study, the mothers of only four of 26 girls admitted seeing manual masturbation in their daughters. With a time-sampling technique of observation, Koch also found masturbation more common in nursery-age boys than girls. No longitudinal data on a representative group of children are available to determine whether a cessation of masturbation during later childhood is characteristic or not. That no universal latent period exists, however, is shown by the studies summarized by Willoughby (1937) where a fairly large proportion of both boys and girls had begun masturbation before ten years of age, well before puberty. Moreover, Malinowski found an increasing amount of heterosexual genital play among the Trobrianders during the years of the latent period.

With Sears' (1943, p. 21) conclusion concerning Freud's erotogenic theory, the writer concurs. "The notion . . . boils down to little more than the presumption that several sources

of pleasurable stimulation are somehow related to one another. Freud first applied the properties of adult genital sexuality to infantile activities centered around the oral and anal-urethral body zones and then assumed that there was a specific quantum of pleasure-seeking that could be channelized through these various zones, making one substitute for another. The evidence cited here supports the general correctness of the first point, but throws less light on the latter." The existence of something resembling the "polymorphous perverse" disposition is corroborated, but the claimed prevalence of a castration complex, and the claim that all children are unable to accept anatomical sex differences without emotional shock, are not corroborated.

Progression of Object Choices. Freud described a progression of object choices which he considered universal in the development of human beings. The first of these, during the autoerotic phase of infancy, is self-love or narcissism. The second is mother love. Thirdly, comes the attachment to the parent of the opposite sex termed the Oedipus complex, which is broken by threats of castration. Fourth, comes the latent period during which libidinal objects are absent as a result of the repression of the Oedipus. Finally comes the fifth stage, beginning at puberty, when heterosexual objects outside the family are chosen.

Freud's first two stages of object choice are probably typical. The newborn child is narcissistic in the sense that gratifying it requires that its basic drive stimuli must be reduced. The results of the laboratory studies related to cathexis coupled with the fact that helpless infants must depend upon sociological mothers for reduction of their biological drives would lead one to expect that these mothers should be the first love objects. Such expectations are confirmed by studies of social responsiveness in infants. These studies have shown that at some time during the first three months, the sound and sight of mothers serve to stop crying (see Ribble, 1944, and also the developmental studies by Buhler and by Gesell). The specificity of the mother choice, however, is to be questioned. It should depend on the discriminative capacity of the child and whether one or several sociological mothers participated in its gratification. Whether this choice of the mother leads to an

actual genital love response is still more questionable, but objective data are lacking.

On theoretical grounds, Freud's claim that the Oedipus situation or preference for the cross-sexed parent is universal in human development would appear to be gross overgeneralization. The complex of intrafamily relationships described by Hamilton's American subjects and the variety of family relationships described by anthropologists shows that the required degree of consistency in family constellations does not exist. Furthermore, studies of parental preferences by Terman and by Stogdill show insignificant differences between those of boys and girls. Stott has found that children on the average criticize both parents equally, but that girls, perhaps because they tend to be more articulate, are more critical than boys. Moreover, a study by Bell has shown that strong emotional attachments outside the family are common even in early childhood. In combination these considerations argue that the Oedipus situation cannot have the importance as an archetype for all future love relations that Freud attributed to it. This is not to deny its existence, nor to deny that the affective attachments of children within the family are important. The studies so ably surveyed by Symonds (1939) confirm Freud's emphasis on the importance of the family, but not on the particular pattern described as the Oedipus situation. It should be mentioned that in much of recent psychoanalytic literature a less literal conception of the Oedipus is employed than Freud described.

Freud's claim of a universal absence of personal love objects during the latent period as a result of the repression of the Oedipus is also an over generalization. It is contradicted by the relative frequency of romantic attachments and heterosexual play during this period reported in the studies by Davis, by Hamilton, and in those surveyed by Willoughby. On the other hand, common observation and a study by Bell have shown that shyness and avoidance of the society of members of the opposite sex in informal situations is very common during the latent period, the gang age. Whether this is due to repression of the Oedipus or to other factors in socialization is not to be determined by these studies in our culture, but the patterns of sex behavior described by Mead in her studies of

sex and temperament in primitive societies argue in favor of the other factors in socialization. The rise of heterosexual love objects after adolescence is, of course, well-substantiated.

The Effects of Infantile Experience. In the dynamic life process, psychoanalytic theory assumes and psychoanalytic evidence indicates that the infantile experiences associated with feeding, toilet training, genital behavior, and the social conflicts within the family set up behavior trends which influence adult behavior. Studies of the relation between the common temperamental characteristics of various primitive groups and the kinds of infantile experience to which the individuals in these groups are typically submitted have tended to confirm this general contention (see summary of the evidence in Ch. 6 of Money-Kyrle, 1939). In the sense that free feeding and late weaning is commonly associated with generosity and optimism, and that oral deprivation and early weaning is associated with stinginess and greed, these anthropological studies tend to confirm Freud's contentions. Such evidence has suggested to Hunt (1941) that indirect tests of this hypothesis could be made by the experimental control of the life history of animals. In one study of this sort, he found that rats submitted to a frustrating feeding schedule in infancy, where time of eating and time between feedings was controlled, hoarded in adulthood nearly three times as many pellets of food as their litter-mate controls allowed free-feeding. This was true for two litters in which the feeding schedule began when the animals were 24 days old, but the same feeding schedule begun when the animals in two other litters were 32 days old did not affect the adult hoarding. Repetitions of this experiment have confirmed the effect, but they have not produced such large differences as that found in the first. Although rats are certainly different from human beings, this experiment lends support to the psychoanalytic contention that the effects of infantile experiences may last and influence adult behavior. The fact that feeding-frustration is not sucking frustration allows the experiment to say nothing about carry-over of the effects of the latter. On the other hand, it argues that the frustration of other drives than those included in Freud's conception of the libido may be important for adult behavior.

For theoretical interpretation of his results, Hunt turned to the principles of learning theory. Assuming that the infantile feeding frustrations produced an autonomic response akin to anxiety, he argued that a little hunger in adult animals with a history of feeding frustration might serve as a conditioned stimulus for this autonomic response. Thus, although such animals enter the hoarding tests with the same strength of hunger drive as their litter-mate controls with a history of free feeding, they have in addition the anxiety drive. Such a theory differs sharply from libido theory in the sense that it makes the autonomic responses or anxiety the key to the effects on adult behavior. The importance of anxiety for neurosis was clearly recognized by Freud (1936), but its chief basis he put in the repression of libidinal drives, and later in the repression of the death instinct, and attributed to these more central significance than they deserve theoretically.

Experimental Origins of Traits and Symptoms. Studies which attempt to recover factors of the life history in interview or questionnaire, although they are inferior to psychoanalytic studies in their completeness concerning dynamic details, afford a statistical check on the generalizations from psychoanalytic studies of individual patients concerning the experiential origins of trait constellations because they start with a broader sample of the population and/or utilize control groups. In general the data from such studies, where relevant, have tended to lend support to psychoanalytic contentions. In his study of marriage, Hamilton found a larger percentage of those subjects who recalled anal eroticism showing such anal erotic traits as stinginess and sadism than were shown by subjects who recalled no anal eroticism. Paranoid patients show a higher percentage of homosexuality, symbolic, overt or measured as femininity on the Terman-Miles scale, than do patients in other diagnostic groups or than do normal individuals. This would be required by Freud's notion that the projection in paranoia is the end product of a series of attempted defenses against homosexual urges. The fact that the surveys by Hamilton and by Terman have found no association of such factors as childhood sex aggressions or shock, goodness of sex instruction, and early attachments to and con-

flicts with parents with orgasm inadequacy in women fails to support the psychoanalytic hypothesis that the inhibition of sexuality results commonly from fears during childhood. On the other hand, the fact that Hamilton found orgasm inadequacy slightly more common among women who continue masturbation after marriage than among women who do not may lend some support to infantile fixation of sexuality on the clitoris as a factor in hyposexuality. The reasoning here assumes fixation to mean a strong habit, and the persistence of a habit is one measure of its strength. Taken together, the various studies of sex-factors in the life history have shown that any deviation from standard heterosexual behavior tends to be associated with higher than average incidence of all the other deviations. This fact lends support to the view that there is a correlation among all perverted impulses (Freud, 1905, p. 571). The fact that Hamilton found the orgasm capacity of women showing any of the perverse tendencies to be lower than average also lends indirect support to the psychoanalytic hypothesis that hypersexuality is often an attempt to discharge nongenital tensions (Fenichel, 1934, p. 281 ff.). This hypothesis is further strengthened by the obverse fact that women selected for high copulatory frequency in marriage tend to have a history of affectionate family life and early indications of strong heterosexual drive as shown by frequent "petting," a higher than average incidence of intercourse with their husbands and with others before marriage. Such confirmation consists only of statistical trends, but when it is considered that such statistical surveys must miss the dynamic relations among and the relative strengths of the forces with which psychoanalytic theory is concerned, only statistical trends could be expected. Only when objective control of the dynamics of the life history has been accomplished can one expect to test the details of psychoanalytic hypotheses about such sources of symptoms. Until then the psychoanalytic method remains as an important exploratory source of such information.

DESCRIPTIONS OF PERSONALITY STRUCTURE

The basic psychoanalytic description of personality structure as id, ego, and superego is not open to experimental attack, for it consists logically of a classification of behavioral trends

in terms of their sources. On the other hand, the descriptive accounts of patterns of adult characteristics derived from continuations of, sublimations of, and reaction formations against the behavioral tendencies resulting from fixation of the libido at various stages (Brown, 1940, p. 206) might be examined with correlational methods. In one such study of this sort, Sears has shown that the correlations among ratings of stinginess, obstinacy, and orderliness in a group of college men are all positive and in the direction predicted by the theory of an anal character type. Experiments employing the method of factor analysis might be designed to test other trait constellations described in the psychoanalytic literature.

FIXATION AND REGRESSION

In his psychoanalytic practice where the perspective of the whole life history is available, Freud found that certain individuals pass through the stages of psychosexual development, and then develop neuroses the symptoms of which represent a reversion to earlier stages of development. Such regression occurs when the libidinal gratification of the individual is frustrated. The object or stage to which the individual returns is determined by the "tenacity with which the libido holds to particular objects or to particular channels." This tenacity, the second factor in regression, Freud called *fixation*, and he confessed his ignorance of its causes.

Fixation. In the laboratory it has been customary to isolate processes for investigation. From the laboratory experiments in animal learning, which have been done quite independently of psychoanalysis, comes considerable information relevant to psychoanalytic process of fixation. The studies, however, have for the most part been concerned with different aspects of a behavior process than Freud considered. In any behavior sequence, one can distinguish (1) the drive, (2) the goal response which reduces the drive, (3) the object necessary for performance of the goal response, and (4) the specific instrumental acts enabling the organism to reach the goal object. While Freud talked of the tenacity or strength of object choices and libidinal channels, the laboratory studies have considered object choices only a little and libidinal

channels not at all. Experimental studies have been concerned primarily with the fixation or reinforcement of instrumental acts.

Freud suggested that attachment to or love of objects, that is, their cathexis, results from gratification of libidinal needs by an external object or person. In this connection, various studies by Mierke, by Rosensweig, and by Nowlis have shown that object preferences of children can be changed by experiences of success and failure in connection with their use. K. A. Williams has shown that feeding rats in a white food box gave it acquired reward value. The rate at which the rats were learning a maze without food reward picked up sharply when the white food box in which they had previously been fed was substituted for an unpainted redwood box in which they had never been fed. S. B. Williams (1934) has shown that rats required more trials for the extinction of a maze habit when they were allowed to enter the food-box in which they ate during training than they required when they were kept out of the food-box. Razran has shown that playing modern music while adult human beings are eating a free meal increases their preferences for it, and that similar results are obtained with photographs of faces. Several other studies have shown that object choices may be acquired through the type of generalization termed identification in psychoanalysis. Duncker, for instance, has reversed the food preferences of children by reading them an animal story in which the hero, a mouse, had liked the unpreferred food. Thurstone has increased the favorableness of attitude toward Chinese and Germans in children by showing them dramatic movies in which people of these nationalities appeared as heroes. Such studies confirm Freud's general conception of the role of gratification in the formation of object choices or in cathexis, but they also indicate that gratification of other than libidinal needs can serve to produce cathexis. They say little about the all-important factors controlling the strength of object choices. Wolfe has shown that increasing the number of grapes given for red chips led the animals to choose red chips instead of white in a free-choice situation, a fact indicating that the strength of the attachment to an object is a function of the amount of primary reward associated with it. Except for this illustrative

example, the factors controlling the strength of object fixation remain unknown.

Experiments in animal learning have uncovered a number of factors controlling the strength of instrumental acts, where strength means resistance to change as it does in the clinical situation. (1) It has been shown that the more trials of practice or reinforcement rats get in a given instrumental act like turning at a given point in a maze or pressing a bar to get food, the more trials required to get them to make a different turn or the more trials required to extinguish the bar-pressing act. (2) With the number of trials held constant, the stronger the drive at the time of learning an act like bar-pressing to get food, the more trials required to extinguish the act. (3) Accuracy of a delayed response is reduced by relatively small differences in the amount of food given to chimpanzees, and this is probably a factor in the fixation of habits. (4) The longer the interval between the time a rat presses a bar and the time it gets food, the fewer the number of trials required to extinguish the act. (5) When a puff of air is given every other trial in conditioning the eyelid reflex, the number of trials required for extinction is larger than it is when a puff is given every trial. Similarly, if rats are given food only every other time they run down a runway to a food box, more trials are required for extinction than are required when they are fed every trial. (6) When such punishing stimulation as shock is given as rats are in the process of turning one of two directions at the choice point in a maze, the choice taken requires more trials for extinction than is required by one not so punished. (7) When stimuli associated with reward in the learning process are present during extinction, more trials are required for extinction than are required without the presence of these stimuli. (8) In the case of relatively brief intervals of a few days, extinction has been shown to require more trials if time is allowed to elapse between the learning and the extinction processes. Although the studies of animal learning were not stimulated by psychoanalytic theory, they clearly have considerable to say about the factors controlling the strength of fixation.

Regression. Freud distinguished between two different types of regression: *object regression*

in which the individual reverts to an earlier object choice and a "return of the entire sexual organization to an earlier stage of development" which has been called *drive regression*. Neither of these forms of regression has been studied experimentally, but a third type of regression, in which the subject reverts to a previous instrumental act (*instrumental-act regression*), has been experimentally investigated, and so has a fourth type which may be called the *primitivation of action*.

The relation between fixation and regression has been clarified considerably by the animal experiments on instrumental-act regression. Hamilton and Krechevsky apparently made the first of these experiments. They trained rats to choose the shorter of two alleys in a single-unit T-maze, then reversed the sides of these two alleys and started retraining. When shock was applied to the rats of the experimental group at the choice point after the retraining had got well underway, nearly half of the animals promptly reverted to turning in the previously learned direction even though the distance to food was longer. A control group simply learned the new habit. Although these investigators interpreted this as regression to a previously learned habit, the fact that not all animals regressed suggested that it might have been simply reversion to an "innate preference" of direction. An experiment by Saunders showed that if rats are first trained to take their preferred direction of turn, a higher percentage of them will regress, and regress more readily, when shock is applied at the choice point after learning in the opposite direction is well underway. Saunders interpreted these results to indicate that regression occurs only to acts with an innate basis, but they may also indicate simply that the extra strength of the first learned direction derived from the "innate" directional tendency of the rats determined the readiness with which they regressed. Evidence for the latter interpretation comes from an experiment by Martin, who, using a similar apparatus, found that the proportion of rats regressing was a function of the amount of training given for the first direction of turn. Experiments by O'Kelly with different apparatus have confirmed Martin's results.

When Saunders shocked animals outside the

T-maze, regression to the first trained direction of turn did not occur. Mowrer has suggested that this is due to the fact that the shock was not applied so as to reduce the strength of the last-learned habit. He trained one group of rats to escape electric shock on a floor-grill by standing on their hind legs. Then he retrained them to escape shock on the floor by pressing a lever at one end of the experimental box. A control group was trained only in the latter habit. When he then frustrated the lever-pressing act by electrifying the lever, all those trained to stand on their hind legs reverted to this form of escape while only one of the five not so trained reverted. This experiment demonstrated that the frustrating circumstances must serve to reduce the strength of the last-learned habit and that regression can occur to a response which is not originally dominant.

Removal of reward has also been effective as a frustrating agent to produce regression. Hull has trained rats to run down an alley for food first in a 20-foot alley and then in a 40-foot alley. In such a situation, rats exhibit a gradient in the rate of running. They start slow, speed up, and then slow down again near the food box. When the animals trained first in a 20-foot alley were learning to run down the longer alley, they slowed down 20 feet from the starting box. This hump in the speed gradient disappeared with training, but it reappeared when, during early extinction trials, no food was given. Using a similar method, Miller and Miles have found a regression to the hump gradient in rats from an administration of alcohol. Moreover, O'Kelly has found that rats will regress to an earlier habit if they are tested after satiation.

These experiments amplify the psychoanalytic conception of regression considerably. They indicate, at least so far as instrumental-act regression is concerned and probably for other forms as well, that regression is primarily a function of the strength of previously fixated behavior tendencies when the current one is weakened. It may be weakened by making it painful (shock), by removing its rewarding character, by the action of drugs, or even by satiation. By analogy, it would appear that having a childish habit which is excessively strong is pathologically predisposing. This is the gist

of Freud's interpretation of the psychoanalytic data relative to regression. By virtue of their long maturation, children must learn and then give up many object choices and instrumental acts before they are socialized adults. How to effect habit progression and the relinquishment of old habits without predisposing children to regressive pathology is one major social problem. What are the laws of hierarchical learning? These animal experiments are merely a beginning, but Mowrer and Kluckhohn (1944, pp. 96-131) have amplified the psychoanalytic story by considering this problem theoretically in terms of the variables (amount of reward, amount of delay, amount of effort, and the amount of danger of discomfort) controlled in experiments on animal learning.

Primitivation of action has also been demonstrated as a consequence of frustration in an experiment with children by Barker, Dembo and Lewin. A scale of constructiveness in play was constructed which yielded a "play age" in monthly units. Then a group of 30 nursery children were individually observed at play through a one-way screen to ascertain as a control their degrees of constructiveness. On a later experimental day, each of these children was shown a new set of toys in the experimental room. He was allowed to play with them for 15 minutes. Then, without explanation, he was led to the other end of the room where he had played on the day of the control-tests, and a wire screen was pulled down in front of the new toys. The child was then observed while he played for 30 minutes with the old toys, and the constructiveness of his play was rated. The resulting decrement in play age averaged 17.3 months, a relatively severe regression in children whose age ranged between 29 and 61 months. Individual differences were considerable, and the amounts of primitivation were positively related to the intensity of the signs of frustration. The fact that one of the children actually exhibited a higher play age after the frustration than before raises an interesting question. What are the variables in the life history of children which control their reactions to such frustrating experiences? This experiment, while it does not isolate these variables, has the value of pointing to their existence and to the incompleteness of present-day learning theory.

The schizophrenias have commonly been considered regressive disorders where the individual has reverted to one of the pregenital stages of psychosexual organization. As an indirect attack upon this interpretation DuBois and Forbes have observed the postures of catatonic patients during sleep. Only nine per cent of the patient's postures were of the predicted foetal variety; and only six per cent of their total sleeping time was spent in these postures. A single normal control subject yielded similar figures. In another indirect attack upon this interpretation, Cameron has compared the frequency of the ways schizophrenic patients complete "because" sentences (e.g., A man fell down in the road because . . .) with the frequency of the ways Piaget had found that children complete such sentences. While Piaget's children exhibited a maximum percentage (83.5) of explanations in terms of *motivation* (e.g., because he wanted to), a minimum percentage (7.5) of explanations in terms of *cause and effect* (e.g., because he stumbled), and an intermediate percentage (9.0) in terms of *logical justification*. Cameron's schizophrenics gave only 32% of explanations in terms of motivation, a maximum (45%) in terms of cause and effect, and a minimum (23%) in terms of logical justification. The sleeping postures and the thought forms of schizophrenics considered here do not confirm the regressive conception of schizophrenia, but these are but two of the many factors in schizophrenic behavior and they are not the drive factor central for psychoanalytic theory. There is considerable experimental evidence that schizophrenics suffer a loss of their acquired drives (Hunt & Cofer, 1944, pp. 1001-1005), but this evidence is also but loosely related to the psychoanalytic theory of schizophrenia.

AGGRESSION

Before Freud formulated his conception of a death wish in his metapsychology (*Beyond the Pleasure Principle*), he had described the native reaction to a frustration of pleasure-seeking as a feeling of hostility toward or an aggressive attack upon the source of frustration (*Mourning and Melancholia*). A reformulation of this simple statement of the relation of aggression to frustration in terms of its quantitative-aspects principles have recently been described by

Dollard, et al. (1939). (See *Frustration and Aggression*, this volume.)

THE DYNAMISMS

Because the theory of the psychoanalytic dynamisms permits experimental isolation, they have invited a number of such tests. Basic among these is *repression* whereby an individual defends himself against unwelcome impulses or the anxiety resulting from the arousal of these impulses. The other dynamisms (e.g., reaction-formation, the substitute-formations, and projection) are primarily supplements to repression.

Repression. Objective studies of repression have been concerned with infantile amnesia, the effect of unpleasantness on memory, the measurement of existing repressions, the experimental production of repression, and with testing the psychoanalytic generalizations about the influences of unconscious processes.

Freud considered that the inability to recall infantile experiences was a function of the disapproval with which the expression of pregenital and genital impulses had been met in the early years. This disapproval served to make such impulses into stimuli for anxiety reactions. One of the ways to avoid the anxiety is to inhibit or repress the impulse, an automatic process, which Freud (1915) termed *primal repression*. Because any memories or ideas associated with the inhibited impulse would tend to arouse the anxiety, noticing them or becoming conscious of them would also be inhibited (*after expulsion or repression proper*). Freud considered this process general or universal. Studies by the Dudychas have shown, however, that recall of incidents from the third to the fifth year of life is common for most adolescents and adults for infantile sexuality. Moreover, many of the 200 adult subjects in Hamilton's study of marriage recalled even sexual experiences from early childhood. Although they say nothing about Freud's theory of repression, such studies argue against the universality of infantile amnesia. Freud was apparently impressed by the apparent vividness of the early experiences of children and he assumed that childhood events should be as well impressed as later ones. Studies of the learning ability in children, however, have shown clearly that the efficiency of memorizing during infancy is relatively poor.

Studies assuming a quantitative relationship between amount of repression and amount of neuroticism have yielded contradictory results. Crook and Harden found that neuroticism, as measured by the Pressey X-O test, correlated $-.37$ with the number of infantile memories given by college students and $-.52$ with the age given for the first recalled experience. When Child repeated this study using several neurotic inventories, he found no such correlations. He also pointed out that the assumption of a positive relationship between amount of amnesia and amount of neuroticism violates Freud's contention that neurosis represents a failure of repression.

Because Freud wrote frequently about forgetting the unpleasant, many experiments attempting to test this hypothesis have simply correlated ratings of the pleasantness of items with the efficiency of their recall. Due to the fact that the unpleasantness about which Freud spoke was the anxiety specifically connected with the arousal of a previously punished impulse, these studies, as Sears (1936) has pointed out, are irrelevant to repression theory. Somewhat more relevant are the studies in which subjects have been asked to recall their real life experiences during a stated interval and then rate these as pleasant or unpleasant. In four or five of these studies, a majority of the recalled experiences have been rated as pleasant. To refine the measure of recall, Stagner had his subject write out a list of odors, objects, and feelings associated with each of the experiences described. When, three weeks later, he asked for recall of these associated items, recall clearly favored the pleasant experiences.

Sharp and also Flangan have designed an ingenious measure of real life repressions which consists of comparing the learning and retention of nonsense syllables paired to yield profane ("jeh-sus," "dam-mit") or sexual ("tew-bal," "piy-nis") meanings with others paired to yield neutral meanings. In both experiments the learning occurred with fewer trials and recall was better after 24 hours for the control than for the experimental lists. These results constitute an experimental confirmation of Freud's hypothesis of after-expulsion or repression of items associated with previously punished impulses. In an extension of this method, Sharp secured from the case histories of a group of neurotic patients lists of 15 words referring

specifically to the sources of their anxieties and another list related to their gratifications. When these words were arranged into lists of paired associates (e.g., "feeling-inferior," "going-insane") both this group of patients and a control group of neurotics showed approximately the same number of trials for learning but significantly worse recall for this experimental list than for a control list. The fact that Sharp also got similar results from a group of normal adults suggested to Heathers and Sears that the experimental pairs were tapping sources of repression fairly common in people with an American background. When they attempted to reproduce Sharp's results with normal adults and college students, however, they failed.

Freud's theory of repression, like nearly all of his hypotheses, constitutes an interpretation after the fact. The psychoanalytic method allows little opportunity to test the hypothesis predictively. Several investigators have attempted to test the theory by way of producing repression experimentally. In what is probably the first of these, Rosenzweig and Mason arbitrarily made children individually complete half and fail to complete half a series of simple jigsaw puzzles. In an attempt to produce anxiety for those failed, each child was told that he had "failed the test." When the series had been finished, the child was asked to recall the names of the puzzles he had tried. Although Zeigarnik had shown a tendency to recall more of the uncompleted tasks, in this situation the children recalled a greater percentage of the completed tasks. The fact that the discrepancy was largest for those children rated high on "pride" suggested that the anxiety involved in the experience of failure accounted for this discrepancy in recall. In a subsequent study with college students, Rosenzweig got further confirmation for this interpretation. He presented some puzzles to one group with the explanation that he was testing their intelligence, and the same puzzles to another group with the explanation that he was seeking information concerning the relative difficulty of the various puzzles. The former group, where pride or the ego was involved in completing the puzzles, recalled more of the completed puzzles; whereas the other group recalled more of the uncompleted puzzles. McGranahan has compared the number of color words given as associations to a list of words by a group of college students

without instructions and by another group who were instructed not to give color names and were threatened with shock if they did. The latter group averaged fewer and showed greater variability than the former in the number of color names given, and the numbers given by individuals were correlated with their resistance to the effects of shock. When Sears and Virshup repeated this study with three groups, they found that both instructions to inhibit color names and shock reduced the number of color associations, but they did not find increased individual differences as a result of the shock. These studies tend to confirm Freud's hypothesis, but as yet they have not provided a method to approach the quantitative problems which Sears (1936) has found explicit and implicit in Freud's theory of repression.

Hypnosis has been used as a way of inducing unconscious processes to test their effects. Luria has induced unconscious conflicts hypnotically and shown that they affect muscle tension and the time and content of word-associations. Huston, Shakow, and Erickson have described effects of hypnotically induced conflicts on social behavior, both verbal and gestural. They have stipulated that these influences are obtained only when the subject exhibits amnesia for the period when the "complex" was induced. Erickson has shown that unconscious conflicts hypnotically induced can alter the content of conversation, produce conflict about smoking, verbal slips and other phenomena like those described by Freud in *The psychopathology of everyday life*.

The conditioning technique has been employed to test Freud's claim that unconscious tendencies are less modifiable than those of which a subject is aware. Baker and Metzner (1939) have reported conditioning the galvanic skin response (GSR) to the sound of a buzzer of which his subjects were unaware because of their instructed concern over the threat of being given a hypodermic injection. When the subjects were shown that they had never been given the injection and the buzzer was called to their attention, seven of the 15 were immediately extinguished. In another experiment, Haggard (1943) has shown that the more his subjects knew about the conditions of the situation in which he conditioned the GSR to a stimulus word with electric shock, the less autonomic reactivity they exhibited and the

more rapidly the GSR could be extinguished. Both the hypnotic studies and those employing the conditioning method tend to confirm the psychoanalytic contention that unconscious impulses have influence and are less easily modified than impulses of which a subject is aware.

REACTION-FORMATION

Reaction-formation, or the tendency to exaggerate the converse of a repressed impulse, has received little experimental attention. In his study of regression, however, Mowrer observed a tendency analogous to reaction-formation in rats. The animals had been trained to press a lever at one end of the experimental box to avoid shock on the wire grill which floored the box. Then, when the learning of this habit had reached criterion, the escape lever was also electrified. On each trial the floor shock was weak at first and increased gradually in intensity. After the animals had experienced shock on the escape lever, the first perception of the weak but gradually increasing floor-shock instigated movement away from the escape lever. When the floor-shock had increased in intensity, the animals returned to press the electrified escape lever. Mowrer interpreted this moving away from the lever as indicating that reaction-formation is a type of response dictated by the relative strength of the anxiety or stimulation from two sources at the time it occurs.

SUBSTITUTE-FORMATIONS

Freud (1915) pointed out that the repression of punished impulses may be maintained by displacement in which some substitute gratification is accepted. Displacement may also occur in response to external frustration. The experimental work on substitution, like that on regression, has involved a different aspect of behavior than that to which Freud applied the concept. The original work of Ovsiankina, which has served as the model, measured the effects of interpolated substitute tasks on the tendency to resume interrupted tasks. With this method she attempted to determine the factors which, on the average, make one task a good substitute for another. In summarizing the results of such studies, H. H. Nowlis has pointed out that the effects of the interpolated substitute tasks on the strength of the tendency to resume the frustrated tasks is a function of

(1) the degree of similarity between the interrupted task and the interpolated substitute, (2) the degree of difficulty of the substitute task relative to the one interrupted, (3) the degree of contact between the tension systems involved in the two tasks, and (4) the degree of reality of the substitute task. Such results amplify the psychoanalytic concept more than they confirm it. Nowlis has also shown that the tendency to resume a frustrated activity is increased when feelings of success are induced in connection with the substitute task, a finding with interesting implications for therapy.

Miller has done experiments relating Freud's concept of displacement to generalization in conditioning. In one of these, rats were made to fight by electrifying the grill which floored the experimental box. When only one rat was left in the box with a glass bottle covered with adhesive tape, electrifying the floor-grill induced him to box the bottle as he had boxed the other rat. A theoretical statement of quantitative laws governing such generalization or displacement which amplify the psychoanalytic conception appear in *Frustration and Aggression* (Dollard, *et al.*, 1939). A theory of response-produced generalization has been given by Miller and Dollard (1941). The approach to generalization by way of semantic conditioning has provided an experimental approach to the associative effects of suppression and repression (Cofer and Foley, 1942).

A special form of substitution is sublimation. Freud assumed that repressed pregenital drives and occasionally genital drives may be transformed into motives which have higher cultural value. In an attempt to test this hypothesis, Taylor has found that all of a group of 40 young unmarried men, who because of their intellectual attainments and esthetic refinement might have been expected to exemplify a high degree of sublimation, habitually obtained direct genital gratification. It is doubtful, however, that this constitutes a test of Freud's theory of sublimation. Taylor's assumption of a negative correlation between intellectual activity and genital activity need not follow from Freud's theory of sublimation. In fact, Freud remarked frequently about the persistence of genital impulses. On the other hand, it is a real question whether the transformations in development involve the basic drives as Freud's theory assumed. A better theory appears to be that of

acquired drives (Mowrer and Kluckholm, 1944; Miller and Dollard, 1941).

PROJECTION

Although Freud failed to define projection adequately, he (1911) interpreted it as a defense mechanism whereby the anxiety aroused by impulses threatening to escape their repression is externalized so that the individual may partially reduce it by seeing himself as blameless or victimized, or control it by avoiding the situations which tend to arouse the incompletely repressed impulses (phobias). In an experiment designed to measure already existing behavior of this sort, Sears had college fraternity men rate themselves and each other on stinginess, obstinacy, disorderliness, and bashfulness. Those men who were rated excessively high in these traits and who also lacked insight, as shown by the fact that their self-ratings deviated markedly from the average of the ratings given them by the group, attributed more than the average amounts of these traits to others. In other words, projection as indicated by the attribution of traits is a function of lack of insight which Sears considered analogous with repression. One might assume the source of such repression to be the guilt for possessing an undesirable trait, but against this assumption was the fact that he found such projection occurring for the desirable ends of the trait-continua as well as the undesirable; for instance, for generosity as well as for stinginess. Wright, on the other hand, has created the conditions of guilt, theoretically considered necessary for projection, and found that projection does occur much more frequently when these conditions are fulfilled. In this experiment, eight-year-old children were individually given a preferred toy and an unpreferred toy to play with. Each of the children in the experimental group was then put in a conflict situation by being asked to give one of the toys to a friend. After this he was asked which toy the friend would have given him. Those in the experimental group who had given away the unpreferred toy, for which presumably they felt guilty, said the friend would have given them the unpreferred toy very much more frequently than did a control group of children who had not been submitted to the conflict situation.

Hunt has observed something akin to projection in rats. The animals had been kept in

more or less continual drive conflict by electrifying their water supply. In test situations, Hunt offered these animals another drinking tube from which they had never been shocked. While they were pursuing this tube, he led the animals to the one from which they had always received shock, but during the tests the shock was disconnected. In several instances, rats drank for a period from the tube from which they had been shocked and then jumped briskly away shaking their noses as if they had felt shock. The behavior implied a hallucination of shock. Whether this behavior constituted more than a conditioned response with sensory components is dubious, however, for it is difficult to see how it constituted a defense mechanism. It resembles more the motivated perception of the projective methods. In this connection, Sanford has found that the frequency with which food items are mentioned in the thematic apperception of pictures is roughly a function of the degree of hunger.

Ideas of reference constitute a special form of projection in which it has been contended that feelings of self-criticism are externalized. Experimental evidence for this contention exists. From his blindfolded subjects' introspections, Coover concluded that the belief that they could tell when they were being stared at came chiefly from attributing objective reality to such subjective impressions as a "feeling of nearness to the experimenter" and a "feeling of being criticized." In a questionnaire study, with college men, Sears has found a correlation of $+.82$ between his measures of their ideas of reference and their feelings of self-criticism.

DREAMS

Freud began his study of dreams because his patients spontaneously brought them into their discussions with him. Many parts of Freud's theory of dreams have been attacked with verbal criticism, but few have received experimental attention. A majority of the experimental work on dreams has been concerned with the effects of external stimulation and the results are of little import for Freud's theory. On the other hand, studies by Cason and by Malamud and Linder have shown that personal problems participate in determining the content of dreams. Freud's theory of universal dream

symbols has been widely criticized, and two investigators, Schrotter and Roffenstein, have attempted to study the problem of symbol formation experimentally by suggesting to a subject while under hypnosis that he would dream about topics where repression was presumed to be in operation. Both Schrotter and Roffenstein obtained dreams by this method wherein symbols similar to those described by Freud occurred (see White, 1944).

CONCLUSION

A majority of the descriptive and theoretical psychoanalytic propositions to which there exists relevant objective or experimental evidence have received some support from this evidence. Notable descriptive exceptions, however, are the generalizations (1) that the Oedipus complex is a universal or even a majority pattern in human development and (2) that the castration complex, strictly defined, is as common or has the power to produce repression that Freud considered it to have. A notable theoretical exception is the proposition that the gratification of libidinal drives alone accounts for emotional attachments to objects or persons. The objective evidence and learning theory both argue that the course of human development involves a broader drive basis and is much more variable than Freud's description of it would imply.

Experimental studies have usually lent support to Freud's conceptions of the dynamisms, but the experiments instigated directly by psychoanalytic theory have discovered no new behavioral principles. On the other hand, the independent evidence from the experimental psychology of learning has amplified considerably the Freudian conceptions of fixation and substitution. Moreover, through this amplification of the conception of fixation, this experimental evidence has added considerably to knowledge of the process of regression, and in the future it promises to produce a body of demonstrated quantitative facts concerned with conflict within the individual.

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EXPERIMENTAL PSYCHOLOGY.—

Definition. There are several interpretations that may be given to the term "experimental psychology," according as the emphasis is placed upon method, procedure or subject matter. Generally speaking, experimental psychology refers to the study of psychology conducted in a scientific fashion, where the emphasis is upon the objective and controlled determination of the stimulus response relationship in behavior. The term is often applied to the type of psychology whose methods and viewpoints are opposed to the subjective and philosophical; in this sense, experimental psychology differs from rational psychology which is a branch of philosophy.

More specifically experimental psychology refers to the procedures by which facts relating to behavior are obtained. When the stimulating conditions are controlled at least in part, when the variables are isolated for purposes of study, where instruments are used for more precise stimulation or more accurate recording of the responses, where the data are expressed in numbers to which statistical computations may be applied—then the findings are looked upon as being experimental, and are generally woven into some theoretical framework without concern as to their practical applications, as is done in applied psychology. Naturally these procedures may be and are applied to nearly all fields of psychology, often with great ingenuity and skill, and in this sense these psychologies are experimental.

Most precisely, however, the term "experimental psychology" is limited to the scientific study of the normal human adult, particularly in the fields known as sensation and perception, feeling and emotion, attention, memory and learning, thought and the higher mental processes, motor phenomena, and kindred topics. On the other hand, the divisions of psychology which are called genetic, abnormal, social and comparative psychology, etc., are not included

in experimental psychology, because, while their procedures may be truly scientific, they do not have as the object of their study the normal adult human.

This characteristic of experimental psychology which differentiates it from other fields of psychology has been aptly brought out by Dashiell in his presidential address to the American Psychological Association in 1938, wherein he stated:

"In high contrast to the experiment is what I am taking the liberty of calling 'the clinical method.' I use the name—for want of a better—to include all those procedures in which the peculiar make-up of the individual person is the primary subject matter, and in which his particular career is considered on its own account. . . . But we must bring into sharper focus the differences between the experimental and the clinical approach to the study of man. In the former the aim is to analyze the specific contingent relationships, and . . . to hold constant or negligible all other variables than the one or two that form our particular concern. By definition, almost, experimentation assumes the isolation of a phenomenon from all incidental and simultaneous cross-phenomena. We study such things as the various factors that modify a *typical* human being's reaction time, or the relationship of time interval to loss of ability to reproduce a memorized passage by adults *in general*, or the dependence of the variable of problem-solving ability upon the age variable in the *average* child. Note two things: (a) we do not isolate the individual person *qua* individual; but (b) we do isolate the particular function or phenomenon in question. Quite to the contrary, when we make a clinical approach to the study of John Doe, (a) we are interested in John Doe not as a specimen but as a unique thing; to be considered *sui generis*, whose past, present and future may be our prime concern; and (b) we are interested in him *in toto* and in his natural and social habitat."

Accordingly the following definition of experimental psychology is proposed: The study under controlled conditions of the behavior of the normal human adult, in an attempt at a

dimensional analysis of the relationship between his internal and external stimuli and his resultant responses. The emphasis, however, must be placed upon the content rather than the procedure, for the traditional fields of investigation of experimental psychology are fairly well defined.

THE MAIN FIELDS OF INVESTIGATION

Oftentimes renewed interest in psychology has originated from cognate sciences, from physiology, physics, biology or medicine. As a consequence no sharp line of demarcation can always be drawn between experimental work that is psychological or that which is physiological, for instance. In other terms, the mode of approach and not necessarily the broad content of a field determines whether work can be classified as belonging to one or other of the major scientific disciplines. When the purpose of an investigation is concerned with the functioning of an individual and his modes of response to varied stimuli, we are concerned with experimental psychology. More and more, as the border lines of certain sciences become tenuous, what may properly be called psychology or physics or physiology is harder to determine, for the factual treasure-house, the techniques, and the hypotheses are often mutually dependent.

Even in the field of psychology itself, one may not always distinguish between experimental psychology, comparative psychology, etc. The lines are not always clear cut, for not only do these branches use the experimental approach but often their fields tend to coalesce. Some division, however artificial, may be made, and one may follow in general the classification scheme of the Psychological Abstracts, and somewhat arbitrarily break up the fields of experimental psychology as follows:

The receptor processes and sensation.
 Perception, discrimination and psychophysics.
 Motor responses, work, fatigue.
 Glandular responses and emotions.
 Electrical phenomena of the body.
 Motivation and voluntary processes.
 Learning and conditioning.

Higher mental processes—attention, aesthetics and thought processes.

The division is not a satisfactory one, for many rather fertile fields of investigation, e.g., attitudes, would have to be located in one of the above groups only by an extension of the ordinary meaning of the terms. It has the merit, however, of forming the basis upon which articles are divided in the current classification of psychological literature and of specifying what comes under the head of experimental psychology.

PROCEDURES AND METHODOLOGY

Ward stated in his article on psychology in the *Encyclopedia Britannica*: "The problem of psychology in dealing with this complex subject matter is, in general—first, to ascertain its ultimate constituents, and secondly, to determine and explain the laws of its interaction." The elementaristic viewpoint of Ward must be modified, and three fundamental questions must be answered in a scientific analysis of a psychological problem:

- (a) What are the significant factors (variables, dimensions) that determine the behavior under investigation?
- (b) How do these factors determine the behavior? What is the stimulus-response relationship?
- (c) How do these factors interact?

The dimensional analysis may take place at an operational level, where the factors are controlled singly or in groups, i.e., the analysis may be unidimensional or multidimensional, or it may attempt to determine how the entire setting affects the result, i.e., it may investigate the interplay of the total forces within the field, in which case the emphasis is on the third objective referred to above.

Experimental psychology has no set procedures for the discovery of factors that determine behavior. Seldom can these factors be directly observed, and hence indirect modes of observation must often be utilized, provided that proof is forthcoming that they are valid indicators of the type of behavior being studied.

Then the ingenuity of the experimenter is put to the test, and in a preliminary investigation he makes use of all clues and all procedures that will disclose the factors at work, provided of course that the assumptions in regard to the relationship have been thoroughly tested. Thus he can observe the behavior under various stimulating conditions; if this variation is not carried out the study is only at a descriptive level, and many exploratory studies are of this nature. Sometimes a frontal attack, so to speak, is ineffective and in an attempt to surmount the difficulties residing in certain stimulus-response situations the experimenter must make use of alternative responses to the same situation, as, for example, when he uses the conditioned-response technique to determine the perception of sub-liminal stimuli. He may even in some types of preliminary work, e.g., the study of apparent movement, ask the subject for his introspections, so as to glean from them how the subject thinks that he experiences stimuli and how he varies his responses accordingly. All this, however, is but in the preliminary stage, and merely aids in the framing of hypotheses, which emerge from the predicated relationships of the variables, and which must then be submitted to rigorous tests and crucial experiments.

When these hypotheses are tested, and a series of measures of the various factors thought to be operative is obtained, the experimenter may conduct a factor analysis, the object of which may be, as Thurstone states, "to discover the principal dimensions or categories of mentality, and to indicate the directions along which they may be studied by experimental laboratory methods." T. V. Moore's factor analysis of the psychotic symptoms is an excellent case in point. This procedure is seldom carried out except in those fields in which the relationships are none too clear-cut.

With the object of exploring the factors which have been singled out for investigation, certain experimental conditions are compared with control conditions, to note if the differences then found in the means or the variabilities are statistically significant. Many psychological investigations stop at this point. Information thus

obtained, while valuable, is prone to be too disparate and unintegrated to be of real scientific worth.

When significant factors that determine a particular type of behavior have been discovered, a systematic dimensional analysis is then called for. One may determine (a) the absolute thresholds, i.e., the initial and terminal points on the stimulus range, that are effective in eliciting the behavior in question; (b) the relative thresholds (j.n.d.), or the increments of the stimulus that differentially affect the response throughout this range. It is to be noted that the study of the absolute and relative thresholds yield measurements, "not only of the appreciation of the minimal amount of differences in the stimuli, but also of measurements of narrow regions in the intensity scale in which sensory qualities change and in which new entities emerge" (Bartley). Much valuable information, e.g., by the critical flicker frequency in the field of vision, has been obtained by this oblique use of the threshold.

The next step is the traditional scientific procedure of factor variation. The functional relationship of stimulus and response is systematically explored throughout the range of the absolute thresholds, by keeping all factors except one constant, and by systematically varying that one, so as to note its effect on the response. At times a multi-dimensional approach may be made, and the methods of analysis of variance and of co-variance used to segregate the influence of the several factors.

The data from the dimensional analysis is generally expressed in the form of tables, graphs and equations. The equations may be descriptive only, based upon a curve fitted to the experimentally found points by the methods of moments or of least squares, or they may be based upon a rational formulation of the conditions obtaining, so that the constants in the equations have precise psychological meaning. When rational equations that are valid and thorough-going in application are obtained, the study has been completed in a truly scientific fashion, for not only have the dimensional

analyses been made, but their interactions are revealed by the equations, so that precise predictions under varying conditions may be made. Owing to the complexity of the factors influencing any particular situation and their dynamic character, it is not to be wondered that only in a few very restricted areas has psychology produced rational equations expressive of behavior.

Despairing of achieving such precise results without seriously distorting the situation, proponents of the field theories study the interaction of the various factors in a different fashion. Rarely do they attempt to control the variables; rather they let them operate freely, and then attempt to analyze their interaction. It is claimed that in life situations one thereby gains a more accurate picture of the total situation, although the dimensional analysis may not be carried out with the same precision yielded by other methods. In the more complicated situations of social, genetic, and abnormal psychology, the methods of the field theorists probably may yield more fertile results—and it is in these fields rather than in experimental psychology that they are more properly applied.

The foregoing statement sketches in broad lines only the steps to be followed in a thoroughgoing psychological analysis. It is understood of course that this sequence is seldom followed in its entirety. Little or no hints have been given as to the details of technique, or as to the devices used in practice to control the variables under investigation.

It is precisely in the manipulation of techniques that experimentation in psychology differs most radically from experimentation in other fields. The psychologist faces difficulties that are peculiarly his own. The paucity of clear-cut, objectively identifiable units of measurement is a problem that frequently confronts him, so that progress in any given segment of the field is slow until the type of behavior under investigation can be readily and accurately measured. Tied-in with this difficulty is the ambiguity of terminology, much of which is a heritage from time-honored phraseology. Most perplexing of all is the difficulty of isolating

for study many of the variables he wishes to study, for many of the powers of the normal human adult, e.g., attention, "form no psychic rubric of their own, but merely furnish the condition for the appearance of certain phenomena, so that some ascribe too little to them, and others too much" (Henning). Even when he flatters himself that he has isolated the requisite variables for study, the psychologist finds that it is almost impossible to maintain experimental conditions constant, due to the complexity and dynamic variability of the factors in behavior.

These and other obstacles demand specialized techniques, which differ for nearly every topic of investigation. They are so numerous that no description of them can be given here, and the reader is referred to the handbooks, such as those of Murchison, Woodworth, Dumas and Abderhalden, and especially to the original published material, for information as to the specific techniques in a given problem.

HISTORY OF EXPERIMENTAL PSYCHOLOGY

The history of experimental psychology is often placed as beginning with the publication in 1860 of Fechner's *Elemente der Psychophysik*; others prefer to assign as starting-point the establishment of Wundt's laboratory at Leipzig in 1879. The difficulty of assigning an exact date to the starting of experimental psychology as a separate subject matter within science is due to the fact that most of the material with which it deals has been studied empirically for centuries, and its scientific procedures had been developed mostly within physiology so that it was not easy to distinguish between the two.

Boring ascribes the influence of physiology and experimental psychology as originating from three main findings:

- (a) The Bell-Magendie Law (1811-1822), which proclaimed the structural and functional discreteness of the motor and sensory nerves.
- (b) Johannes Müller's (1826) doctrine of specific nerve energies.

- (c) **Helmholz's (1850) discovery of the velocity of the nerve impulse.**

These important findings spurred on research in sensation, an interest which has been maintained in experimental psychology to our own day. He points out that discoveries important for psychology came also from other fields,—the contributions of physics on perceptual laws of vision and audition, the discovery of the personal equation by astronomers, 1820, which uncovered the very active field of reaction time, and the study of hypnotism which aroused interest in abnormal psychology.

It must be remembered that the original approach to psychology was through philosophy, which depended upon observation, introspection and empirical findings for its facts. Gradually through the centuries the need was felt for scientific procedures in the collection and collation of these facts. As Boring states: "Psychology grew out of the fusion of a philosophical psychology that had been going on within philosophy and a physiological psychology that had been developing within psychology." Only when scientists working in other fields investigated material of a psychological nature, by methods which were effective in their own disciplines, did the hope arise that psychology itself would become scientific, and that qualitative descriptions would give place to quantitative procedures. When, therefore, techniques were developed within physiology that gave promise of being applied to psychology, enthusiasm for the new science was aroused.

Investigation started early in several fields and has persisted to the present time, so that the content of experimental psychology has been clearly defined almost since its beginning on the basis of contributions from physiology and physics. Research in experimental psychology was chiefly confined at first to the fields of vision, audition, psychophysics, space perception and reaction time. Helmholtz published *Die Lehre von den Tonempfindungen* in 1863, before the completion of his monumental work, *Optik*, in 1867. The erudition, the precision of research, and the mastery of the interpretation which he brought to bear on these topics, gave

an initial impulse to the study of vision and audition which has enabled these ever since to maintain their dominance in the field of sensation. Other brilliant investigators like Hering, Aubert, and Brücke made important contributions at that early period chiefly to vision.

The publication by Fechner of his *Elemente der Psychophysik* in 1860 paved the way for fundamental investigations of mind by initiating methods which were purely psychological yet which could be applied to the field of sensation. His work stimulated men like Volkman, Mach and Delboeuf in the field of psychophysics prior to Wundt.

Two other problems were then investigated in which interest has long since dwindled—the personal equation, studied by Donders in 1868, which started the vast literature on reaction time, and the study of the time sense under the inspiration of Mach in 1865 and of Vierordt in 1868. Some progress was made in the experimental investigation of taste, touch, rotation and space perception and the beginnings of an attack on the higher mental processes might be seen in Muller's work in 1873 on attention.

Such was the state of psychology prior to the publication by Wundt in 1874 of his *Physiologische Psychologie*, which gave a systematic exposition and an experimental orientation to the new science. Shortly after, in 1879, he gave a tremendous impetus to research by establishing the first laboratory at Leipzig.

Naturally the area which could be investigated by the new methods was narrow, and many topics, particularly those of thought, memory and will, at first seemed resistive to investigation, but they did not remain so long. It was Ebbinghaus who, inspired by Fechner's method in the domain of sensation, determined to investigate these processes, chiefly in the fields of association and memory. He devised his own material and procedures,—the nonsense syllables and the methods of complete mastery and of savings. In 1885 his epoch-making *Ueber das Gedächtnis* appeared, and opened up a new field which G. E. Müller and his associates developed, and in which has arisen a huge mass of research.

Research on feeling and emotion, one of the last fields of psychology to be studied experimentally, finally got under way under the inspiration of the James-Lange theory, 1884, and to some extent, of the discovery of the electric phenomena of the body.

With an initial body of data, in part borrowed from the cognate sciences, with a methodology of its own for the investigation of mental operations, and with research started in all its major fields, psychology stood on the verge of a tremendous expansion. Research laboratories sprang up, chiefly in Germany and America, and at least a score of them were operating prior to 1894. To record the work done therein, psychological journals began to appear. The principal ones with the date of their founding and their editors were:

Philosophische Studien, 1882, Wundt.

American Journal of Psychology, 1887, Hall.

Zeitschrift für Psychologie, 1890, Ebbinghaus and König.

Psychological Review, 1894, Baldwin and Cattell.

L'Année Psychologique, 1895, Binet and Beaunis.

Psychological Monographs, 1895, Angell.

Psychological Index, 1895, Warren and Farrand.

There have been many others, founded since, but these were the early journals of experimental psychology, and they still carry on. The *Philosophische Studien* was discontinued in 1903, and was replaced in 1905 by the *Psychologische Studien*, under the editorship of Wundt. It ceased publication in 1918. The *Psychological Index* was discontinued in 1936, but its work was taken over by the *Psychological Abstracts*, which were started in 1927, by Hunter and Willoughby.

The spread of experimental psychology into countries other than Germany, with the consequent diversification of viewpoint, is a matter of some interest. This is not the place to discuss the origin and tenets of the various schools, nor the polemics they occasioned, but since they did influence experimental psychology by steering research into definite fields and by focusing attention on specific problems, a brief survey of some of the more important systems seems called for.

The students who gathered around Wundt, worked in his laboratory and helped him expand the body of experimental findings and build up his psychological system, came not only from Germany, but also from France, England and America. When they returned to their own countries they brought with them an enthusiasm for research and a desire for the establishment of their own laboratories. Practically all the first-generation American psychologists studied under Wundt and, while many of them showed the influence of the master, their own work often developed along other lines.

Wundt's leadership was dominant over a period of some forty-five years, until his death in 1920. His systematic views were rigorously defined, and changed but little with the years; his psychology was essentially sensationistic, elementaristic and introspectionistic. Titchener, an Englishman who came to Cornell shortly after taking his doctorate in 1892 under Wundt, carried on for thirty-five years the Wundtian tradition in America.

The psychology of Wundt and Titchener was one of content, and narrowly followed the original lines of investigation of the fields of sensation and perception, to which were added in later years those of feeling, attention and association. In general the higher thought processes seemed as resistive as ever to the techniques of the classical investigators.

It must not be thought that content psychology held the field alone. Contemporaneously with the Wundtian school, the Austrian school, inspired by Brentano, and under the leadership of Meinong, Lipps, Benussi, Ach and Külpe, were developing what has been called act psychology. These men were essentially phenomenologists rather than experimentalists, and their theoretical orientation, their empirical approach, and their fields of investigation (thought, will, memory, imagination, space perception and aesthetics) differed considerably from those of the content school.

The reaction against the elementarism and the sensationism of Wundt was headed chiefly by the school of Gestalt psychology, which was an offshoot of the Austrian school. Its leaders were Wertheimer, Koffka and Köhler, its centre,

Berlin, and its chief organ, the *Psychologische Forschung*, founded in 1921. At the outset its main field of investigation was perception, chiefly that of apparent movement, but it rapidly turned to other fields. This was a powerful, aggressive new movement, with a well-integrated theoretical system which was essentially dynamic in viewpoint; more than any other it helped to correct the narrow static viewpoint of the older psychology.

In America, particularly, new systems opposed to Wundtian structuralism arose; for example, there was the functionalism of Ladd, James, Dewey and Angell. Most of these schools were short-lived, and were but variants of some pragmatic viewpoint, for the American psychology tended to be practical, applied, and to stress individual differences. It was also interested in animal psychology. From this interest which is reflected in the early work of Thorndike and Watson came the revolt of behaviorism against introspection and the mentalistic viewpoint generally. With the passing years the polemics of the early days have disappeared and behaviorism is no longer an issue, but fortunately the chief contribution of the behaviorists, the stressing of the objective and the scientific, has been taken over by the operationalists of the positivistic school.

Experimental psychology in France and England never did attain the same stature that it acquired in Germany and America, partly because it clung longer to a philosophic background, partly because its chief interests lay in other fields, applied, clinical or abnormal, and to some extent because the psychologists of these countries did not enjoy the academic prestige achieved by psychologists in America. There have been great British and French experimental psychologists, men like MacDougall and Pieron, whose writings and research have helped to make experimental psychology. That the output of research material in experimental psychology of France and England has been small compared with that of America and Germany, may be seen from the fact that the proportions that these countries have contributed to the total as recorded in the *Psychological Index* runs approximately as follows,—America, 35 per cent; Germany, 33 per cent; France, 15 per cent, and England, 3 per cent, with the balance contributed by other countries.

It is impossible to detail the progress that

has been made over the years and the changes which have occurred in experimental psychology. Information may be indirectly gleaned in other ways,—by the trend of the articles which have appeared, by the number of laboratories established, and by the research activities of members of certain scientific societies; studies have been made along all these lines.

Perhaps the most revealing of all those methods is the analysis of the publications which have been recorded in the *Psychological Index* since 1895, and in the *Psychological Abstracts* since 1927. These analyses of the material in the *Index* have been made by Maller and Goodenough over a forty-year period, and by Goodenough for the *Abstracts* over a six-year period. In the material that follows they are completed for the *Index* and are brought up to date for the *Abstracts*.

The literature is enormous. Some 157,086 titles were recorded in the *Index*; since it ceased publication in 1936, there have appeared 44,355 in the *Abstracts*. Of these 41,262 in the *Index* and 11,177 in the *Abstracts*, or 26.1 and 25.2 per cent respectively, are listed in the sections that are generally grouped under experimental psychology. More than 200,000 articles of which slightly more than one in every four is devoted to experimental psychology!

There has been a steady increase in the output, slowed down a bit by the world wars, from a yearly output of about 1,850 titles per year to a peak production of about 6,800 titles in 1931, retarded during the depression years, and advanced to 6,700 in 1938 and 1939, when the war brought another recession. Thus the amount of literature published in psychology has increased about three and one-half times since the appearance of the *Index*.

The proportions devoted to experimental psychology have tended to be fairly constant, with the following variations: Starting in the four-year period, 1894–8, with about 31 per cent, it increased rapidly to a maximum of 47 per cent in the four-year period 1902–1906. From 1910 on it has remained fairly constant, averaging around 27 per cent, in spite of the reductions in the war periods. The variations in the relative proportions of experimental psychology are to be found chiefly in the main fields of motor responses and of sensation and perception. The divisions of the higher mental processes—thought, attention, memory and learning and of feeling

and emotion have remained very constant except in the last decade, when their proportions have considerably increased. These proportions may be stated only in a general way, due to the changes in indexing, and the difficulties of noting with precision just what is the main topic of an article, as pointed out by Fernberger in his analysis of the material of the Abstracts from 1932-6. It is worthy of note that the first indexing of psychological publications was begun by Ebbinghaus and König in the first volume of the *Zeitschrift für Psychologie*, and was continued in substantially the same manner by the Index and the Abstracts. Minor variations in the mode of indexing have occurred from time to time, so that it is difficult to fix with precision the relative proportions of the literature devoted to any one field. The broad sections in the Psychological Index that come under the topic of experimental psychology, together with the percentage that each section is of the total amount of literature cited from 1894, is as follows:

- (a) Sensation and perception, psychophysics, 9.9%
- (b) Feeling and emotion, 1.4%
- (c) Motor phenomena and action, voluntary action, learning, work, fatigue, 10.0%
- (d) Attention, memory, imagination and thought, 4.7%

Substantially the same categories were used in the Abstracts as long as the Index was published. In 1937 they were modified, and the new sections, together with the percentages that these sections are of the total literature cited in the Abstracts since that period, are:

- (a) Receptors and perceptual processes, 10.2%
- (b) Learning, conditioning, intelligence, attention and thought, 8.7%
- (c) Motor and glandular responses, including emotion and sleep, 6.3%

Obviously the amount of experimental data, together with their theoretical framework, has reached the point where it is no longer possible to gather them in a textbook after the type of Wundt's *Grundzüge der physiologischen Psychologie*, the first edition of which appeared in 1874 and the sixth in 1908-1911, Külpe's *Grundriss der Psychologie*, 1894, or Titchener's *Experimental Psychology*, 1901-1905. Woodworth, after working diligently for some years,

published his *Experimental Psychology* in 1938. He admits the difficulty of keeping up with the literature, and acknowledged that he was obliged sharply to curtail some of its phases. As a consequence one may look for some kind of complete presentation only in the handbooks, which do not always cover all fields of psychology, or in monographs on specialized topics. There is a tendency now-a-days for both of these types of works to be the product of several writers.

Reviews on selected topics appear from time to time in the *Psychological Bulletin*. In their efforts to yield an exhaustive survey of the pertinent literature, they do not always give a balanced and integrated summary nor a critical evaluation of the material. A digest of the main findings and the generally accepted facts of experimental psychology on individual topics may be found in the *Encyclopedia*.

PRESENT-DAY ORIENTATION

The last decade has brought important developments in techniques, methods, and trends in psychology. The utilization of modern techniques and apparatus has permitted the precise investigation of phenomena, notably in the fields of vision and audition, as a result of which new chapters involving a wealth of carefully collated facts welded into workable theories have been added to our knowledge of sensation and perception. Data in nearly all fields are being subjected to a close scrutiny by modern statistical analysis, so that certain topics are becoming highly mathematical in treatment. Many of the statistical devices, such as factor analysis, are definitely the contribution of psychologists, and have been successfully applied in other branches of science.

Experimental techniques of some promise are being developed. Psychologists are no longer content with restricting themselves to psychophysical methods, which brought results where precision and elegance were obtained at the cost of artificiality of set-up and restricted applicability of results. Without forsaking these and other effective techniques, based upon rigid control of a single variable, new ones are being rapidly developed, where the emphasis is upon naturalness of the situation, economy of experimental design, and upon dynamic rather than static factors. As a result of attacks upon the

constancy hypothesis, multi-dimensional analysis, particularly in the field of learning, is steadily gaining ground.

Systematic programs are being carried out at certain centres, where research is concentrated upon well-defined problems, integrated to deal with definite and comprehensive areas, and developed along a theoretical framework. Such, for example, is the work done at Yale under Hall. The logic and fruitfulness of such a systematic attack as compared with sporadic and isolated investigations, no matter how brilliant, cannot be questioned.

The research inspired by theorists is no longer confined in the narrow fashion that formerly characterized the various schools of psychology. Modern psychology tends to become more and more eclectic, and proponents of all systems strive to incorporate within their theories proven experimental facts no matter what their origin. Broadened in scope, chastened by criticism, yet more tolerant of divergent viewpoints, experimental psychology is now well beyond the adolescent stage to which Titchener referred.

Not content to sharpen its attack upon traditional fields, psychology is submitting to experimental investigation branches and topics that for long years had been built up chiefly on an anecdotal, empirical clinical or theoretical base. Comparative psychology, of course, is the most outstanding example of this statement, but genetic, child, clinical and abnormal psychologies are now amassing a significant framework of experimental information. Possibly the healthiest sign of all is the collating of experimental fact from all branches of psychology to enlighten hitherto-isolated phases of psychology—such, for instance, as the bringing to bear upon the study of personality findings from widely separated fields of psychology, as evidenced by McVeigh Hunt's handbook, although it must be confessed the thread that binds them not infrequently seems tenuous and flimsy.

In an ever-widening circle experimental psychology is extending its field to cognate sciences, utilizing and amplifying the facts and theories of these branches to strengthen its own foundations. As a result, specialization is rapidly going on, not only within the major fields of psychology, but also on the fringes of physics, biochemistry, physiology, and other sciences. The trend is a healthy one, tending alike to keep psychology away from academic isolationism

and to emphasize the dynamic characteristics of all sciences that touch on man.

FUTURE DEVELOPMENTS

One might venture a prediction relative to trends in experimental psychology. Advances are to be looked for in apparatus design. Startling results are to be expected in fields where electronic equipment may be utilized, and already in electro-encephalographic and action potential studies, in nerve and muscle conduction, in vision and audition, notable advances have been made because electronic equipment has been adapted to those fields. One may expect that the work will go ahead rapidly and will be extended to other sensory fields, such as taste and touch, etc., which hitherto have been resistant to ordinary techniques. Continuous automatic recording of both stimuli and responses has long since been utilized and may be expected to be widely applied. Cinematographic studies have been used in many fields, e.g., comparative and child psychology, but ultra-high-speed photographic techniques will undoubtedly be developed for more precise studies in motivation, emotion, motor abilities, and possibly in personality and in other fields.

Experimental design will be refined,—precision and reliability of results will be achieved with greater economy of experimentation. Statistical treatment will acquire clearer psychological meaning without losing mathematical precision. The trend towards operationism will bring about clear-cut dimensional analysis of many at least of the variables that affect experimental results.

Standardization of units, procedures and terminology, a goal long since reached by the older sciences, and hopefully looked forward to by psychologists, probably will be achieved at least on a modest scale.

The precise role played by the nervous system will be disclosed, and generally speaking the compact integration of structure and function, of physiology and psychology, will be more effectively studied when electronic techniques are more widely applied. Possibly the electron microscope may yield facts of great portent relative to the structure and function of the cell and nerve fibrils. For so long has psychology talked uncertainly of the role played by the

synapse, etc., that positive facts would indeed be welcome.

Perhaps the development of the mathematical biophysics of Rashevsky, Householder, Landahl and others may tend to provide the requisite integration of neurology and psychology. Already these workers have made notable contributions to both fields, and many of their theoretical equations apply satisfactorily to experimental data.

Another contribution may be expected in the not too distant future,—viz., the repetition of some of the classic experiments, under more searching conditions and in the light of more recent findings and theories. Full confidence will not be established in published findings until these experiments have been duplicated in other laboratories and with varied samplings of subjects. As a result of the enormous expansion of experimental psychology in the armed forces, investigations will be undertaken on a scale that will make samplings of one hundred or one thousand subjects look small indeed. Fractionation of the data from repeated samplings of the subjects in these investigations will yield information relative to the predictive value of our statistical manipulations. Not the least of the contributions of this type of rigorous and exhaustive research will be the elimination of many hasty generalizations, based upon inadequate reliability. Psychology could make no more progressive move than the discarding of unfounded and unscientific statements from its texts.

Toward the goal of control and prediction of behavior, so elusive and so seldom approached in the past, vast strides will be taken when the dynamic factors as well as the static ones are taken into account. One may look forward to a development of the dynamic studies inspired by Lewin, Brown, and others to a clear emergence of principles determining the interplay of personality and social factors in behavior. Cross-sectional and longitudinal studies, closely but artificially controlled laboratory studies, to which methods psychology is deeply indebted for past contributions, will not be neglected, but the impact of field theories will be felt in the broadening of experimental objectives and the elasticity of hypotheses and interpretations.

Sooner or later experimental psychology must come to grips with problems of real life, enmeshed in their total setting, and not content

itself with the study of artificially restricted and, to that extent, distorted behavior. American psychology, with Cattell first to show the way, emphasized individual differences, even while prone to assume a constancy and a one-to-one stimulus-response relationship within the same individual that belied the real facts. Continental psychologists, on the other hand, have been more conscious of the kaleidoscopic changes of an individual's behavior in what superficially appears a constant stimulus-response relationship. These dynamic points of view are held mainly by what Dashiell calls the clinical psychologists, but many experimentalists are revising their own theoretical structures along some such lines.

As long as it was dominated by philosophy, experimental psychology advanced only too slowly. It still remains too physiological-minded to achieve maximum progress. Helpful as physiology has been in the past, all-important as are its contributions of the present, it has engendered too rigid and too simplified a mode of thinking to achieve optimum results. One need point only to the paucity of significant relationships found, say, in the study of feelings and emotions by physiological methods.

Most glaring of all is the inadequacy of such methods in the broad and important fields like imagination, thought, motivation and voluntary action. They are not unassailable to experimental psychology, but they will remain resistant so long as old-fashioned techniques based upon static theories are used. When some new Ebbinghaus appears to bring simple, effective, and perhaps daring procedures to bear on these problems, the elusive higher mental processes of early days, the real key to normal human adult behavior, may perhaps be found.

So complex is the living organism, so disparate and variable the external stimuli to which it is subjected, and so potent and labile are its internal forces that behavior cannot be expressed in simple terms, nor is it experienced in constant ways. Hence it is not to be expected that formulae of universal application will be found to characterize behavior. As experimental psychology probes deeper into the mystery of man, greater mysteries may be uncovered. Wider, surer knowledge there certainly will be, but hardly complete nor final.

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EXPERIMENTAL ABNORMAL PSYCHOLOGY.

—The segment of psychology that logically falls under the heading of Experimental Abnormal Psychology can be considered from a number of different points of view. If a rather broad point of view of the area to be discussed is accepted, the scope would include practically all phases of abnormal psychology. This would entail the writing of quite a number of volumes to cover the field adequately. The segment which will be discussed, therefore, is quite restricted in range. After careful consideration of the various aspects of the problem it has been decided that this exposition should be limited to the experimental attempts that have been made to bring about abnormal behavior by modifying some aspect of the internal or external condition of the normal organism. The reports of case histories of human beings; therapy applied to the already mentally disordered; discussions of psychological and physical traumas; and physiological and neurological changes manifested in the neuroses and psychoses do not seem to the author to satisfy the requirements of experimental abnormal psychology. In almost all of the preceding types of work information concerning the status of the individual before the abnormal behavior developed is lacking.

While numerous inferences may be drawn concerning causal factors at work and changes that have taken place, it is impossible to state in too many instances whether the variable factors that are encountered are concomitant with the disorder or are causal. For example, it is very difficult to ascertain whether a personality disorder following skull fracture is the result of the fracture itself or whether the trauma has only intensified already existing tendencies. Similarly, exposure to danger in battle with resultant neurosis does not clearly answer the question whether the battle situation was the precipitating cause or whether there were other

coexisting basic causes which heretofore had not been manifest. Clinicians are well aware that in most of their patients numerous and varied causes interplay with each other in producing the end result. The extent to which each of these causes contributes to the total can only be estimated, since they cannot be isolated, or factored out, or held constant. Much of the literature referred to in the source books which are usually thought of as falling in the field of abnormal psychology does not conform to our original definition in many respects. The experiments are not designed to bring about abnormal behavior in humans but rather to prove some theory of personality dynamics. With the exception of very few isolated studies on human beings and the vast volume of work on the lower animals, investigators have not produced behavior that would be designated as abnormal behavior by any currently accepted definition.

The various criteria of abnormality that have been set forth from time to time run the gamut from the simple self-comparison criterion to the mass-comparison criterion using the quantitative statistical approach. Both of these criteria are inadequate and both of them ultimately rely on arbitrary bases as to where the line of demarcation should be drawn. Other criteria which depend upon such concepts as social and individual harmfulness and lack of appropriateness are likewise not precise enough to give us a ready answer. Criteria for admission to mental hospitals are equally uncertain. A résumé of symptoms found in patients admitted to mental hospitals shows that our criteria are almost hopelessly confused. The symptoms include: behavior directly affecting the safety and welfare of others; behavior detrimental to the self; bizarre behavior; emotional and thought disturbances; speech abnormalities; memory defects; delusions; hallucinations; and psychomotor disorders. Not all of the symptoms are encountered in every case and there is considerable overlapping of symptoms in the various cases.

This report is not concerned primarily with the controversy of criteria of abnormal behavior as to whether a person is sane or insane in a legal sense. The issue cannot be avoided ultimately if any assay is to be made of the field of experimental abnormal psychology. Similarly, it is impossible to avoid the problem of separat-

ing the field of abnormal psychology from the fields of neurology, physiology and medicine. Although mind and brain depend upon each other, they certainly are not the same. Mind depends upon physiological and neurological conditions, yet a complete understanding of neurology and physiology cannot insure an understanding of mental capacity and human activation. With respect to that which is mental, the organism is in a constant state of flux. Every stimulus is subjectively different from all previous stimuli due to prior experience and the results of modification of mental life by prior experience. Therefore the need of developing a more thoroughgoing "psychology" cannot be overemphasized.

A suggestion recently made to the writer seems to offer a reasonable basis for determining whether behavior is normal or abnormal. If the individual voluntarily relinquishes responsibility for his behavior or if society compels him or her to relinquish control of his or her behavior, then the behavior may be considered abnormal.

It should be pointed out again that it is doubtful whether phenomena that could be defined as abnormal by such definitions have been produced experimentally. Experiments on human beings, on aggression, repression, submission and frustration show that behavior can be modified in accordance with the theories promulgated and within the limits of the framework of the experiment. It is highly dubious whether either a true neurosis or true psychosis has ever been produced by such experiments. Almost all of the investigators imply that if the experiment demonstrates the theory held, then similar activities carried far enough or extended to other fields of activities would produce "abnormal behavior."

The inclusion of experimental work on infra-human species presents still other problems. Is the behavior which is obtained "abnormal"? Can it be inferred that the behavior is psychologically produced? Can causal relationships based on analogous reasoning be classed as sound bases for explaining abnormal behavior in human beings?

Let us examine some of the investigations that have been carried out by experimenters in both the human and infra-human fields. Let us determine whether they satisfy the general rules of a well planned experiment. Further, let us

ascertain whether they are experiments dealing with the production of abnormal behavior.

If we examine a typical case history, a clearer picture of the use of case histories as they may be applied to experimental abnormal psychology may be obtained. The following case of involutional melancholia illustrates the general symptomatology and furnishes the basis for a practical discussion of cause and effect.

Diagnosis. Involutional melancholia. F. F., female, aged 50, married, Jewish.

Main Facts. The patient is a tense, meticulous person who has been treated for fifteen years for indigestion. At the menopause she became worried and censured herself about the acquirement of property which was later disposed of at a sacrifice. She was restless, depressed, discontented and went from hospital to resort without improvement. She finally refused food, denied the existence of her family and thought she was a "stone."

Family history. While a number of the members of the family are neurotic no frank mental illness is admitted.

Personal history. The patient was born in Germany, and came to the United States at the age of 16. She had pleurisy, neuritis, and an ovariectomy and appendectomy. She had been treated for indigestion for 15 years. Puberty was established at fifteen and was irregular with dysmenorrhea. There was an artificial menopause with flushes following an ovarian operation. The patient was married to a traveling salesman at the age of seventeen and has two sons. She was active, tense, enjoyed cards and loved her home. She was rather moody with swings of elation and withdrawal from friends, rather than depression.

Two years ago she bought an apartment house and was somewhat elated over her purchase, but when her husband did not approve she became worried. She was emotional, anxious, and began to have a feeling that it must be disposed of. This was finally done at a considerable loss. Several months later she complained of depression, anxiety, and felt that she must leave home. At a health resort there was some improvement but a mild accident accentuated her gastrointestinal symptoms. She could not sleep, was dreamy, had no interest, and changed hotels in one city several times. Then she complained of being heavy, dazed, and fearful of impending disaster. She became listless and in-

different, denied the existence of things and refused to accept her sisters as her family.

In the first month of her hospitalization she answered all questions with "yes" and "no," "I don't know—don't remember," and was preoccupied, depressed and tearful. Occasionally she would say, "I am too heavy. I can't read or move. I can't do anything. I am a stone." At other times she asked the nurse, "Are you me? I am not me. I don't know why—I am nothing. I weigh only ten pounds. I am little and dirty—it is just like a baby crying." In answer to questions she said, she was "supposed" to have had a husband and "supposed" to have had a family. She thought that everyone was against her and that she was the only one left and believed that all those about her were ghosts. She said she had no stomach, called the hospital a prison, misinterpreted the ward activities and denied the existence of everything. She continually talked about her unworthiness and remarked that everything was lost and she would never recover. Her movements indicated retardation and difficulty in execution of activity, while her facial expression was one of distress, apprehensiveness and depression. She said she had been a liar and deserved to be punished, that she has had unpleasant thoughts about her family and has treated them badly. Later the feelings of unreality became accentuated and she refused to eat, saying she had no stomach and had turned to stone.

The patient gradually became more childish in behavior and was frequently seen weeping, "me can't—me can't do it—me too little—me too dirty." She crawled about on the floor, refused her food and cried, "Oh my—me so little—you so big." She became increasingly untidy in her habits and resistive to any care, refused to go to the toilet saying "me don't have to go to the toilet—me don't have to have bowels moved." She had to be bathed, dressed and tube fed and became more and more resistive and abusive. She talked like a baby, muttered to herself and dribbled saliva like an infant.

The patient slowly but gradually improved and began to speak of learning to walk and talk and slowly developed an interest in adult things. Her interests and abilities in occupational and recreation classes were carefully watched and fostered and she began to show a more adult attitude. She was allowed to visit home periodically and slowly began to take

over her duties at home. At the present time she has been out of the hospital for two years and is doing well.

It can be discerned readily that both psychological and physiological causes are at work. Whether the symptoms presented would have developed in the absence of either of these factors is impossible to state. We cannot be sure, therefore, what the causal factor really is. If we refer to one theory for explaining the mental content of such patients a line of reasoning similar to that which follows would be employed. There is an increasing egoism which is equivalent to restriction of external interest. Since pure egoism finds no satisfaction in this life, there follows preoccupation with death. Along with the desire for death, there is, frequently, however, revulsion against it, since egoism implies resistance to death. The presence, in the same patient, of apprehensions of death together with suicidal attempts clearly shows these two tendencies. Insomnia in these patients may then be accounted for on the basis of the fact that sleep is the symbol of death. Nihilistic delusions appear when the loss of interest in the world is projected. Since things are no longer desired, their existence is denied. Other authorities point to the gradual decline in health and vigor, the increase in chronic illness in family and friends, as well as in one's self, coupled with the realization that time is passing swiftly, and that the attainment of ambitions is not likely to occur. This second line of reasoning differs very much from the first one. Still a third line of reasoning is possible. Since there is evidence of glandular dysfunction due to the menopause, the mental symptomatology may be explained on this basis. It can be demonstrated further that hormones of various kinds alleviate many of the mental symptoms in some cases of this type. Which of these lines of reasoning is correct? There is no answer to this question. The answer depends in part upon the theory held by the therapist.

Case histories are deficient in a number of respects and cannot be included under the heading of experimental abnormal psychology. In spite of the fact that they supply much needed information for therapeutic purposes they do not enable one to show distinct cause and effect; nor do they usually throw much light on the period prior to the episode, since much of this information has to be gleaned from other people

whose memory of pertinent facts is extremely poor.

A case reported by Kraines illustrates the causal factors at work in mental disorder following brain injury:

"Mr. S. M. was a window washer in a large firm. He fell three stories one day and fractured his skull, wrist, and nose, and was unconscious for about an hour. He remained several weeks in the hospital; but when he recovered from his physical bruises and injuries he found that he could not concentrate; forgot easily; was dizzy most of the time, had frontal and right-sided headaches, slept poorly, saw double at times and at other times 'couldn't see for a moment or two'; always felt tired; was unable to read even the daily newspaper; and worst of all, flew easily into rages at the slightest irritation, and on occasion had struck his wife. He was home for six months, and then was given a position as a janitor. He had a cash settlement for his injury and was content therewith. Since that time, however, the symptoms enumerated above had continued despite the fact that all physical examinations were negative. He was diagnosed as a neurotic because there was no physical indication of his disabilities, and because of his emotional outbursts."

"Study of his background revealed the ordinary difficulties and the usual mother-in-law problems, but these same problems had existed before the accident, and he not only was unaffected by them but was a happy and hard-working person. Psychotherapy was useful only in that it made the patient less intolerant of his inability to work, but it essentially did not change his symptoms. The so-called neurotic symptoms were in all probability based on actual damage to his brain tissue, the damage probably being multiple petechial hemorrhages in the silent areas. In this case there was definite evidence of skull fracture, but in many instances there may not be any skull fracture, and the damage to the brain and personality may be as great or greater."

In this case there are certain indisputable facts. The patient fell and received physical injuries. He developed mental symptoms which persisted after recovery of the physical injuries. There are, in addition, certain unknown or uncertain facts in this situation. What was the extent of the brain injury, if any? Are the cir-

cumstances surrounding the accident entirely responsible for the mental symptoms? Since psychotherapy did not entirely succeed, is it logical to assume that there must be brain injury? We might inquire whether some other form of psychotherapy would succeed. Further, it is pointed out by Kraines that study of the patient's background revealed ordinary difficulties that might produce such symptoms. While many of these questions might be answered on theoretical bases, the end result is that we still cannot say with certainty what the real cause is.

Pathological changes in brain structure are often assigned as causes of mental disorders. For example, changes that occur as a result of syphilis and brain tumor may be accompanied by well systematized delusions and hallucinations. There is no question about the existence of abnormal behavior, but how the brain structure change produces the mental disorder is another matter. Delusions of grandeur, accompanied by syphilis, may disappear after diathermy treatment. No one assumes that the spirochetes themselves cause the peculiar mental symptoms. Nevertheless after the spirochetes are killed off the symptoms may be abated. Explanatory recourse is made to vicarious functioning of other parts of the brain; to resumption of function of certain brain areas due to reduction of inflammation in non-destroyed areas. These two attempts at explanation are directed toward a functional viewpoint which might be termed psychological. Other theorists attempt to explain the delusional systems on personality trends co-existing at the time of destruction. In other words, these theorists try to explain why one person develops delusions of grandeur and another person develops delusions of persecution. It is certainly true that a study of tissue pathology will not suffice for these explanations. We are still groping in the dark for a satisfactory psychology that can be applied to these problems.

Let us consider next a case of nervosa anorexia, since it will serve to illustrate certain problems related to physiological changes and mental disorder.

A male college student about 25 years of age reported for his first job after finishing college. Three days later he vomited shortly after coming to work. This continued for several days. The vomiting gradually extended so that he

could retain no food. Medical advice was sought but no physical basis for the difficulty could be discovered. The patient became prostrate and had to be hospitalized. He continued to lose weight, became seriously depressed and almost died. Psychotherapy was instituted. It was soon discovered that the patient had a deep conflict about his impending marriage. When this problem was ironed out recovery took place at a rapid rate.

This case seems to present clear-cut psychological problems from which it seems possible to construct adequate psychological cause-effect relationships. Reiss, on the contrary, reports that some cases of almost similar kind did not respond to psychotherapy unless adjunct therapy with hormones, particularly those of the pituitary gland, was instituted. The difficulties of distinguishing between the organic and ideational bases of the disorder are still extant. Since such disorders may be brought about by either organic or psychological causes, or by both, our conclusions can be only relative and tentative and do not satisfy the requirements for a clear-cut experimental abnormal psychology.

In drug addiction, where the effects are chiefly physiological in the initial stages, it is assumed that the habit is based largely on physiological need. This point of view can be argued more forcefully from the fact that addiction has been produced experimentally in primates. These animals presumably do not have the psychological problems that would lead to addiction. This point of view is often held with regard to humans, namely that conflict and the desire to escape from their problems lead to drug addiction. It may be questioned seriously whether human beings deliberately decide to become addicts. It is also doubtful whether a human being to whom the drug is administered with full knowledge of its consequence and with the understanding that an addict was to be made of him or her would go through with the experiment. Even if the experiment were carried out, there remains the question whether the individual would continue to be an addict. It is quite possible that the ideational factors would be such that the habit would be immediately thrown off in spite of the apparent physiological need. The uncontrolled factors in drug addiction are so numerous that it is unsafe to state positively cause-and-effect relationships. Saul's analogical explanation of a case of

alcoholism tends further to emphasize this conclusion.

"The patient was chronically pessimistic, anxious, and mildly depressed. He tried to escape by recourse to alcohol and promiscuity, although he was really very inhibited sexually. Drinking and promiscuity to him were symbols of defying conventions, and means of escaping from dependence and submissiveness, and resulted in feelings of deep guilt and anxiety. When in the country, away from women, bosses, and obligations he was much relieved. A number of his early dreams were dreams of being in a sexual situation with a woman and being seen by a man with consequent anxiety."

Some of the experiments on personality dynamics more nearly satisfy the requirements of experimental abnormal psychology than the material that we have been discussing. Many of these experiments proceed from a working hypothesis. They utilize both experimental and control groups. They attempt to modify behavior of normal subjects under rather rigid conditions. The main objections that can be raised are whether abnormal behavior is produced and whether the interpretations made conform to the results obtained.

The psychoanalysts claim to have developed what may be characterized as a strictly psychological approach to personality dynamics. Consequently, illustrative experiments related to some of their theories and interpretations would be in order. We shall select for discussion experiments dealing with each of the following concepts: aggression, regression, substitution, and repression. All of these modes of response have been indicated as alternative modes of action to a frustrating situation. One of the experiments, referred to frequently, that illustrates aggressive behavior resulting from frustration is that of Barker, Dembo and Lewin. They found that there was more aggressive activity of children (such as fighting and knocking) during the time when their toys, although visible, were separated from them by a wire net, than when the toys were separated from them but not visible. While the authors do not state that abnormal behavior as defined previously, is produced, some writers seem to imply that the possibility exists. These writers use the results of the experiment to evaluate the pronouncements of Freud and other theorists. While the author agrees that this experiment

along with many others on human beings and animals tends to substantiate a theory of personality dynamics, the question must be raised whether the behavior obtained is abnormal. It must be questioned further whether repeated exposure to frustrating situations can be controlled in such a manner as to produce neurotic behavior. Motives and methods of satisfaction of drives are exceedingly complex in the case of children and adults. Nearly all of the theorists, such as Janet, French, and Pavloff, in explaining individual differences in response to frustrating situations, fall back upon some vague concept such as "inherent constitutional difference." Even in the foregoing experiment individual differences in reaction are found. Are they to be explained on a basis of differences in prior experience? If so, what are these prior factors? How do they contribute to the modification of behavior? It is quite evident that for a complete picture to be obtained we have to go beyond our tightly constructed theory and our limited experimental situation.

Hovland and Sears, in discussing the relationship between strength of instigation of aggression and frustration, point out the relation between frequency of Negro lynching in the southern states and the farm value of cotton. Presumably, when income is low, basic needs are thwarted and the result is aggressive behavior manifested by lynching. While Sears states that this is only illustrative, the implication is that it supports the theory of aggression as related to abnormal behavior. One might ask why lynchings do not occur in other parts of the country with low values of manufactured products. Is the situation controlled by the relative proportions of the white-colored population? Why do not all of the white people participate? Would not the theory of suggestion be an adequate substitute? The information we do not have is tremendous, yet there is a tendency to isolate a particular set of circumstances which are advanced to prove a theory of abnormal psychology.

Regression has been defined in a number of ways. It has meant the return to an earlier form of behavior, consistent with the developmental pattern for the "sexual drive"; it has meant the breakdown of behavior into simpler forms that have existed previously; or it has meant the re adoption of earlier forms of responses that satisfied particular drives. *Regression*

tion is determined in part by the object of fixation, the strength of the drive and the strength of the frustrating agent. One of the theories to account for schizophrenia is that of regression. The individual, unable to cope with life experiences, adopts (regresses) an earlier form of behavior in which the responsibilities of life no longer have to be met. In this situation we might expect intellectual regression as well as behavior regression. Although Cameron's studies of the already mentally disordered cases do not conform to our original definition, he has examined the reasoning of schizophrenics and he does not confirm the fact that intellectual deterioration takes place. A study by Du Bois and Forbes on the regressive tendencies of catatonics to assume foetal positions during sleep does not show that these positions are adopted more frequently by abnormal cases than by supposedly normal cases. Both of these experiments illustrate the high variability of responses in both normal and abnormal people. If some do and some do not, how are individual differences to be accounted for? Can we show that normal subjects subjected to repeated frustration revert uniformly to these forms of behavior? The work of Mowrer, Hamilton, Krechevsky, Maier, Miller and Sears on animals tends to show that under appropriate conditions some form of regression takes place. Is this due to the limited repertoire of response? Is this due to a restriction of ideational processes in the lower animals? Masserman draws upon the experimental work on animals to explain rituals, obsessive behavior, negation, masochism and sexual aberrations, yet when he discusses the experimental work on psycho-surgery he inclines toward reduction in variability of response and stereotypy in behavior as accounting for such behavior. He would seem to imply by analogy that intellectual and ideational processes are the most important factors in producing behavior anomalies. Such processes as these are most generally accepted as being restricted in the lower animals.

One of the modes of response to the normal sex drive when that drive comes in conflict with the environment is substitution of non-conflicting modes of satisfaction. This is referred to as substitution or sublimation. A classic example of sublimation centers in the sadistic tendency of man. This is the tendency to inflict punishment or practice cruelty on the object which is

loved. A surgeon may be manifesting the normal response to this thwarted tendency. That is, he cuts and hurts people, but in the reversal of the process he heals them rather than hurts them. A man whose impulses would indicate a long list of murders and other crimes, by sublimation turns out to be a writer of crime and detective stories. Actors and actresses may be supposed to have had a strong tendency toward exhibitionism or narcissism. Their sex urges are sublimated.

If individuals who have made a successful social adjustment (i.e., do not have neurotic symptoms) in nearly all respects to the sex drive, are studied carefully, we might not expect them to resort to autoerotic experiences or illicit heterosexual experiences. One study, nevertheless, indicates that these so-called normal healthy and otherwise well adjusted individuals respond to their sex drives by resorting to types of behavior that may well be labeled as deviating from normal behavior. On the whole, the theory of substitution or sublimation is a beautiful theory but the mechanisms involved are shrouded in mystery and do not satisfy the criteria for experimental abnormal psychology.

An impulse that results in frustration accompanied by painful experience may be repressed, i.e., the behavior accompanying the impulse may disappear. Similarly, ideational representation of the impulse may be inhibited. Some writers have translated the Freudian concepts into reflex terminology. Extinction of a response becomes the equivalent of repression; inhibition with the negative phase and reinforcement with cathexis. The theory has been approached from a number of different points of view. One approach is that of studying recall of pleasant and unpleasant experiences. If repression is a dynamism that really functions, then more pleasant than unpleasant experiences will be recalled. The results of this line of experimentation are not unequivocal. The bulk of the evidence, however, seems to support the thesis.

Another approach is that of using an experimental situation in which failure is the punishing agent of the ego. When children or adults are unsuccessful do they tend to repress (forget; the response becomes extinct)? An experiment by Rosenzweig will illustrate the method. Two groups of students were presented puzzles to solve. One group was told that the puzzles were a type of mental test, hence their performances

indicated their mental ability. The second group was told that the experimenters were interested only in ascertaining information about the puzzles, so that the individuals' performance was not personalized. Later both groups were asked to recall the completed and uncompleted tasks. The first group recalled more of the completed tasks whereas the second recalled more of the uncompleted tasks. Since the first group had a conflict over their failure and the second group did not, repression supposedly took place. While this type of experimentation throws light on the theory stated earlier, it does not demonstrate that abnormal behavior necessarily arises in this manner. All learning situations usually involve failure, otherwise the individual would have no knowledge of when responses are correct or incorrect. As Dunlap has pointed out, in the course of learning the individual is constantly "unlearning" and relearning. Further, he has shown that the "final response" which we call "correct" is not identical with any previous response. While these experiments are ingenious, it is only by unwarranted extension of interpretation that we can apply them to abnormal phenomena.

In the field of animal experimentation we are beset by all of the problems stated earlier in this report; the main problems being whether the behavior exhibited by animals is abnormal and whether theories determined from behavior exhibited in the narrow framework of the laboratory situation can be applied to human beings. It has been shown that various sub-human species—rats, dogs, sheep, pigs and primates—can be treated in such a manner that they will exhibit behavior which appears similar to abnormal behavior in human beings. Symptoms similar to those that occur in people are undoubtedly encountered in animals. Anxiety (manifested by bodily disturbances such as muscle tension, heart rate changes, respiration changes, etc.) apparent fear or phobia, repetitive and stereotyped behavior (compulsive behavior), adopting simple or prior modes of response (repression), and sex perversions have been brought about. Whether this behavior is explained by conditioning theories, psychoanalytic theories, field theories, or some other theory makes little difference. The two questions that have to be answered are (1) Is the behavior abnormal? and (2) Does human abnormal behavior develop in the same way? These criteria

have been proposed for evaluating animal behavior: (1) Is the behavior maladaptive? (2) The maladaptive behavior must be exhibited in a situation that has been met in a more adaptive manner; (3) The maladaptive behavior must be present as long as the animal is subjected to the precipitating situation. Can these criteria be applied successfully to abnormal behavior in human beings? It is relatively simple for a person to say that animal behavior is maladaptive, but is the behavior really maladaptive for the animal? We do not know enough about ideational processes in animals to make this inference. When this criterion is applied to the human species the problem is much more complex. Is tobacco smoking maladaptive? It depends on one's point of view. Is masturbation or homosexuality maladaptive? This depends again on the point of view taken. In some cultures such behavior may be considered maladaptive, in others not. If an animal continues to select the longer of two pathways to food, even though the animal previously selected a shorter pathway, can this be said to satisfy the second criterion? This situation may be compared with that of the human being who continues to work for a lower salary even though he previously earned a higher salary and the opportunity still exists to earn the higher salary. No one would seriously contend that the individual in question is abnormal. We would argue that all the circumstances for explaining the behavior are not clearly enough known. The third criterion is inextricably tied up with the first two. If a rat is forced to discriminate between two stimuli that are near his threshold in order to obtain food and exhibits a disorganized type of response or manifests bodily disturbances, we interpret such behavior as maladjustive behavior. It seems to the writer that the behavior, on the contrary, is highly adaptive for the situation. It is true, nevertheless, that a human being who has heart palpitation, excessive perspiration, or stomach disturbances resulting from an emotional situation that cannot be solved would be classified as a neurotic. Both the rat and the human may show different behavior upon removal of the stress situation. Both may show a continuation of the behavior. In some cases, however, we cannot predict what will happen. Here we run into the problem of individual differences that cannot be explained by the experiment or by the information available con-

cerning the human being. This last factor is a very important one and needs further study.

Our problem becomes progressively complex if we examine further some facts relative to the production of abnormal behavior in lower animals. The conventional methods of producing neurotic or convulsive behavior in rats is to subject them to air blasts, loud noises, jingling noises, difficult discrimination situations and electric shock stimulation. We assume that maladaptive behavior occurs as the result of being unable to escape from these situations. It has been shown that rats if allowed to seek cover in a closed compartment do not show as marked a tendency to be disturbed. It is obvious that the environmental situation is important. Even in the absence of escape possibilities rats do not uniformly exhibit the behavior. Genetic factors seem to be important. Strains of rats produced by inbreeding are more susceptible. Similarly wild rats and tame rats behave differently. Can these differences be explained by the simple experimental situation? Dietary factors can also be shown to contribute to the end result. Deprivation of Vitamin B complex tends to increase the maladaptive behavior. What is the relation of these various factors? No one can answer this question accurately. Neurotic behavior in adult persons has been brought about by a deficiency of the Vitamin B complex and psychosis occurs as a result of nicotinic acid deficiency. Yet not all human beings with the same degree of deficiency will develop neurosis.

Experimentation on hoarding of food, selection of diet, modification of behavior by destroying brain tissue furnishes valuable insight into the controlling factors of normal and abnormal behavior. Criticism of the kinds already mentioned may, however, be leveled at these types of experimentation.

On the whole, the field of experimental abnormal psychology has been approached indirectly. This may be the only possible approach, since experimenters are unwilling to run the risk of creating abnormal behavior in human beings and are unable to control all of the variable factors that enter into the production of such behavior.

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EYE, THE.—The human eye (bulbus oculi) is the organ of sight centered each in the cavity of its bony orbit within the frontal plane of the skull where it is suspended within enveloping sheets of adnexae and rotated by the attachment of six muscles. Associated with it are certain accessory structures bearing an intimate functional relationship including the eyelids, the conjunctivae, the lacrimal apparatus, the extraocular muscles, the fasciae, fatty tissue, blood-vessels and nerves.

Each orbital cavity is roughly the shape of a quadrilateral pyramid whose base is parallel to the frontal plane of the skull and whose apex is directed backwards towards the occiput. The bony mosaic of each cavity contains the lacrimal bone and the os planum of the larger ethmoid bone, and planes of the frontal and sphenoid bones. Towards the apex the orbital cavity presents three foramina or openings which permit the transmission of important structures between the eye and the cranial cavity. These include (1) the optic foramen transmitting the optic nerve and artery, (2) the superior orbital fissure transmitting the ophthalmic vein, the third, fourth and sixth cranial nerves and the first branch of the fifth cranial nerve and (3) the inferior orbital fissure which transmits the infraorbital artery and maxillary nerve. The invagination of the human eye within the cavity of the bony orbit in contradistinction to the location of the organ of sight in some of the more primitive vertebrates is a development which serves to protect the human organ from traumatic injury.

The somewhat flexible suspension and fixation of the eye within the orbit is effected by three enveloping structures namely (1) the orbital fascia or fibrous tissue sheet, (2) the conjunctiva and (3) the lids. The orbital fascia serves as periosteum firmly bound to the bony walls of the orbit from where it is reflected to cover the globe from the corneal margin to the optic nerve (Capsule of Tenon), to form a

septal prolongation joining the tarsal ligaments and to invest the extraocular muscles, thus binding them to each other, to the lids and to the margins of the orbit. The capsule is pierced by all of the structures which enter the globe and within the fascial folds are found branches of the ophthalmic artery and vein (communicates to cavernous sinus), the three cranial nerves supplying the extraocular muscles, sensory branches of the fifth nerve and the ciliary ganglion. This ganglion lies just to the outer side of the optic nerve and receives motor fibres from the third cranial nerve, sensory fibers from the fifth cranial nerve and sympathetic fibers from the carotid plexus in the neck. Its short ciliary nerves enter the posterior pole of the globe. Long ciliary nerves from the sympathetic supply smooth muscle fibres sparsely distributed in the capsule and their tonicity serves to check the inward pull on the globe by the action of the extraocular muscles. Hypertonicity of these muscles due to sympathetic stimulation causes protusion of the eyeballs as observed, for example, in exophthalmic goiter. During ocular rotations both the globe and investing capsule move together as a unit upon a cushion of surrounding adipose tissue (fat).

The conjunctiva is a thin, transparent layer of mucous membrane covering the front of the globe excepting the cornea and investing the inner surfaces of the lids. It extends from the circular cornea at the latter's margin (limbus) and covers the anterior globe as far as the base of the lids where it is reflected at the fornix to cover the inner lid surfaces. The conjunctiva is sensitive, being abundantly supplied by branches of the fifth nerve. It contains lymphatics and is provided a vascular supply from two systems, i.e., the posterior conjunctival from the palpebral, which is the more superficial, and a deeper anterior ciliary. The conjunctival membrane provides not only a sensitive protecting surface to the front of the globe but serves as an anterior supporting membrane and a smooth surface for the gliding of the lids over the eyeball.

The eyelids (palpebrae) consist of a larger upper and smaller lower fold of skin (integument) lined by conjunctiva and containing areolar tissue, fibrous tissue, muscle, blood-vessels, nerves and glands. The fibrous tissue in the form of comparatively dense horizontal

bands (tarsi) is attached to the lateral orbital borders by the external and internal tarsal ligaments and to the orbit above and below by the tarso-orbital fascia. The tarsal plates thus formed furnish a semi-flexible support to the lids. The lids are closed by the contraction of the circular orbicularis muscle supplied by the seventh cranial nerve and opened by the contraction of the vertically acting levator palpebrae superioris muscle which is supplied by the third cranial nerve. The tarsi contain some strands of smooth muscle supplied by sympathetic nerve fibres (Mueller's muscles) whose stimulation effects involuntary twitching of the lids. The tarsal plates contain a row of sebaceous glands (Meibomian glands) which are filled with a fatty secretion and open along the free margins of the lids where the secretion serves to lubricate the tissues and prevent the overflow of tears when the latter are secreted at the normal rate.

The outer and inner lid margins are referred to as the outer and inner canthi respectively, and located at the inner canthus a small reddish elevation of modified skin, the caruncle, is observed. The eyelashes (cilia) border the free margins of the lids and are supplied with sebaceous follicles (Glands of Zeiss) and modified sweat glands (Glands of Moll). The arterial pattern of the lids is in the form of two anastomosing vascular arches derived from the ophthalmic and facial arteries. The veins empty into the ophthalmic, temporal and facial veins and the lymphatics drain into the preauricular, submaxillary and parotid lymph glands. The sensory nerve supply is derived from the fifth cranial nerve. The lids and cilia protect the eyes from injury, foreign bodies and excessive light at the same time serving to distribute the tears and glandular secretions over the conjunctiva, thus maintaining the exposed portion of the globe lubricated, moist and transparent.

The excretory part of the lacrimal apparatus consists of the lacrimal glands, small oblong bodies composed of acini of cuboidal cells similar in structure to the salivary glands, situated in the upper and outer portions of each orbit. The excretory ducts from the gland pass downward and empty by separate orifices along the external half of the conjunctival fold at the fornix. Thus the tears are excreted from the upper outer surface of the conjunctiva and wash downwards and inwards to be collected at the

two inner canthi by the puncta which open into the lacrimal sac through two small canals (canaliculi). The lacrimal sac is a small reservoir composed of fibrous and elastic tissue and lined by mucous membrane which contains a row of ciliated columnar epithelial cells. The sac lies in a groove formed by the lacrimal bone and the frontal process of the maxillary bone. The tears are swept from the sac to the inferior meatus of the nose through the lacrimal duct which leads downwards, outwards and slightly backwards from the sac. The lacrimal excretion is slightly alkaline, saline and bacteriostatic. It serves to wash foreign material from the conjunctival sac, to keep the eye moist and to provide an antiseptic lotion against the inroads of pathogenic bacteria. When the eye is irritated and under emotional stress and lacrimal excretion is greatly increased.

THE OCULAR GLOBE AND TUNICS

The outline of the globe may be considered as being formed by the segments of two spheres, the smaller and outer (whose circumference corresponds to the ellipse of the cornea) being above twelve millimeters in diameter, and the larger and inner (whose circumference corresponds to the ellipse of the sclera) being about twice the diameter of the smaller. The cardinal points which are concerned with the disposition of incident and emergent light rays within the eye may be conveniently enumerated as follows:

(1) *Principal Points.* 2.0 mm. behind the cornea in the anterior chamber being points so situated that when incident rays pass through one of the points the corresponding emergent ray passes through the second point.

(2) *Nodal Points.* 7.0 mm. behind the cornea near the posterior pole of the lens representing the optical center of the eye, incident rays passing through being axial or secondary rays and not refracted by the dioptric system.

(3) *First Principal Focus.* 14 mm. in front of the cornea where parallel rays in the vitreous meet.

(4) *Second Principal Focus.* 23 mm behind the cornea between the macula and the disc where parallel rays meet after being refracted by the dioptric system of the eye.

(5) *The Center of Rotation.* 10.0 mm. in front of the retina in the vitreous.

(6) *The Optical Axis.* A line connecting the

center of the cornea, the nodal point and the posterior principal focus.

(7) *The Visual Line.* A line passing from the object of regard through the nodal point to the macula.

(8) *The Line of Fixation.* A line joining the object of regard with the center of rotation.

(9) *The Angle Gamma.* The angle formed by the optical axis with the line of fixation.

(10) *The Angle Alpha.* The angle formed by the visual line with the major axis of the corneal ellipse.

The tunics of the globe consist of three portions, i.e., (1) an outer supportive layer made up of the fibrous sclera and transparent cornea, (2) a mesial nutritive layer comprised chiefly of vascular tissue divided into the iris, ciliary body and the choroid (uvea) and (3) an inner perceptive layer, the sensitive retina, composed by the expansion of the optic nerve (end organ of sight).

The Sclera. The sclera or outer coat of the globe is about one millimeter in thickness and is composed of tough, opaque and inelastic fibrous tissue of about the same consistency of peritoneum. It furnishes the necessary strength to contain the intraocular pressure and the required rigidity to enable the function of the extraocular muscles which are firmly attached to this layer. The sclera is invested by Tenon's capsule and is pierced posteriorly by the optic nerve at the lamina cribrosa.

The Cornea. The cornea is the circular transparent portion of the front of the globe being a continuation of the sclera but with a somewhat shorter radius of curvature than the latter from which it is demarked by a circular region referred to as the limbus. The cornea is made up of five layers, i.e., an outer layer of epithelium, Bowman's membrane, a connective tissue stroma comprising most of the corneal thickness, Descemet's membrane and an inner layer of endothelium. Capillary loops from the anterior ciliary vessels encircle the cornea and provide for its nutrition through a network of lymphatic lacunae and canals distributed throughout its stroma. The cornea is very sensitive, being supplied by numerous twigs from the fifth cranial nerve. The cornea forms the front window of the eye, transmitting and steeply refracting entering light waves. Local irregularities of the anterior surface of the cornea (irregular astigmatism) and symmetri-

cal disparities between the radii of curvature of opposite corneal meridians (regular astigmatism) both serve to distort incoming light rays.

The Iris. The iris is the colored circular curtain forming the anterior part of the vascular and nutritive uveal tract and is suspended behind the cornea and in front of the lens, thus dividing the anterior chamber into an anterior and posterior part. The connective tissue stroma of the iris is spongy and contains branched pigmented cells, circular (sphincter pupillae—3rd nerve) and meridional (dilator pupillae—sympathetic nerves from the cilio-spinal center of the lower cervical spinal cord) muscle fibers, two anastomotic vascular rings derived from the posterior ciliary, the anterior ciliary and the ophthalmic arteries and which communicate at the crypts of the iris with the anterior chamber, thus permitting rapid exchange of aqueous from the iris to the anterior chamber and vice versa. The iris is covered anteriorly by endothelium and posteriorly by a limiting membrane and retinal pigment layers. Iris tissue is very sensitive, being supplied by numerous branches of the fifth cranial nerve. The center of the iris is perforated by an expansile circular aperture, the pupil, whose diameter is varied by the interaction of the circular and meridional muscle fibres for much the same purpose as we vary the diameter of the lens aperture of a camera. In this manner the amount of light which enters the eye is regulated and the marginal rays which would interfere with the clarity of the image (spherical aberration) are cut off. Normally the pupil contracts upon exposure to light, with accommodation and convergence, a phenomenon effected by the circular fibers of the sphincter pupillae muscle, the efferent impulse coming from the third nerve nucleus in the floor of the Aqueduct of Sylvius, to the third nerve trunk, to the ciliary ganglion and finally by the short ciliary nerves to the sphincter muscle. The light reflex may be direct or consensual, the latter phenomenon being explained by the fact that the light stimulus in one eye is carried by the optic nerve and passes to both optic tracts and in this way to the nucleus of the third nerve of each side. Dilation of the pupil may be due to paralysis of the third nerve (paralytic mydriasis) or to excessive stimulation of the sympathetic (spastic mydriasis). Contraction of the pupil may be due to stimulation of the third nerve

(spastic miosis) or to paralysis of the sympathetic (paralytic miosis).

The Ciliary Body. The ciliary body is the wedge-shaped part of the tunica vasculosa and extends from the posterior base of the iris to the anterior part of the choroid. The ciliary process is very vascular, being supplied by the greater circle of the iris plexus and the anterior ciliary arteries, and nutrient material is secreted therefrom to the cornea, the lens and part of the vitreous. The ciliary veins pass to the vortex veins of the choroid, while some of the veins from the ciliary muscle pass backwards, pierce the sclera and run beneath the conjunctiva with the anterior ciliary arteries. The ciliary body contains unstriped muscle tissue supplied by the third cranial nerve which, upon contracting, draws the ciliary process and choroid forward and inward, thus relaxing the suspensory ligament of the lens and releasing the tension of the lens capsule, thereby permitting the lens to assume a more convex shape (accommodation). Tschering has advanced the theory that the contraction of the ciliary muscle increases the tension of the suspensory ligament and that this causes a peripheral flattening and an anterior bulging at the center. The purpose of accommodation is to furnish a dynamic residuum of focusing adjustment of emerging light rays so that a clear image is focused on the retina. We have seen that the greatest refraction takes place at the cornea but this is a fixed quantity and static. The auxiliary focusing power of the lens through the action of the ciliary muscle permits a finer adjustment which may be varied to the need.

The Choroid. The choroid forms the posterior part of the uveal tract and extends back from the ciliary body to the posterior pole ending at the optic disc where its pigment is observable in the form of a dark circular ring. The choroid is arranged in five layers and is composed of a rich network of anastomosing vessels and pigmented cells. The function of the choroid is to furnish nutrient material to the retina, vitreous and lens. We have noted that the uveal tract contains an abundance of pigmented epithelium. The amount varies with the individual, being greater in persons of dark complexion and less in blond individuals. In albinos this pigment is lacking. The purpose of the pigment may be considered as an adaptation to absorb and dampen excessive light.

The Retina. The retina is the transparent expansion of the optic nerve lining the interior of the globe and extending from the entrance of the nerve at the disc (3.0 mm. to the nasal side of the posterior pole) forward to the ora serrata of the ciliary body. It is traversed by the retinal vessels which enter the globe with the nerve. The arteries are non-anastomotic or end arteries. From within outward the retina is composed of the following layers, i.e., (1) the internal limiting membrane, (2) the nerve fiber layer containing the vessels, (3) the layer of ganglion cells, (4) the plexiform layer, (5) the inner nuclear layer of bipolar cells, (6) the outer plexiform layer, (7) the outer nuclear layer, (8) the external limiting membrane, (9) the layer of rods and cones and (10) the layer of pigment cells. A little to the temporal side of the posterior pole and below the horizontal plane of the globe is a small ovoid glistening area of retina 1.5 mm. in diameter, the macula lutea, in the center of which is a small depression, the fovea centralis. This is the region of central direct vision where the visual acuity is the highest and we receive a clear and detailed impression of an object upon which we fix. Visual acuity diminishes rapidly beyond the foveal area. In this sensitive area we find long narrow cones but no rods. From the macula towards the periphery of the retina the rods increase in number until they predominate over the cones in the more peripheral area.

Scotopic or twilight vision is sensitive to low light intensities and to motion. It is achromatic, insensitive to red, with the greatest luminosity perceived in the region of the green band of the spectrum. It is presumed to be the more primitive visual faculty and is effected by the retinal rods which increase in number concentrically towards the periphery. The low light threshold in scotopic vision is conceivably due to the following factors:

(1) The anatomical arrangements of many rods being connected to a single ganglionic cell (via bipolar cells), thus summing subliminal stimuli and decreasing the threshold stimulus.

(2) The relative abundance in the rods of a bleaching substance in the form of a conjugate protein rhodopsin (visual purple) which absorbs some light rays converting photic energy to a nerve impulse in the analysis of a complex chemical compound to simpler ones which apparently irritate the rods to form an impulse.

The photochemical change or phase of vision may be summarized as follows:

When light strikes rhodopsin the luminosity of the spectral region around 530 M μ (green) is absorbed and changes the rhodopsin to retinene (visual yellow), a compound resembling carotene which is the precursor of Vitamin A, and then to a colorless substance identical to Vitamin A. It is supposed that the simpler chemical compounds resulting in the analysis of rhodopsin irritate the rods sufficiently to generate a nerve impulse. Under the influence of light the retinal pigment migrates between the rods and cones as far as the external limiting membrane. In the dark the retinal pigment withdraws towards the nutrient choroid and collects around the external segments of the rods where rhodopsin is synthesized by the action of Vitamin A, retinene and a colloid in a period of time ranging from ten to forty minutes. In the process some of the Vitamin A is lost and must be replaced through the circulation from its storehouse in the liver. Nyctalopia or "night blindness" occurs in some degree when the above outlined processes are interfered with in any way.

Photopic or daylight vision (light-adapted eye) is a function of the retinal cones in the perception of detail (form sense) and in the perception of colors (central vision). The photopic threshold is higher than the scotopic due to a decreased amount of photochemical pigment (visual violet) as compared to the rods and to a decrease of stimuli summation in the cone connectors as the macula is approached. (Light threshold 0.0134 with maximum in yellow-green at 580 M μ and chromatic at 0.25 meter-candles.) It is postulated that the original and primary function of the cones is light perception mediated through a photochemical process and that color perception is a later specialized function of the cones. It has been presumed that in cone function the primary and elemental gray perception has evolved to yellow and blue perception and that yellow perception further evolved into the perception of red and green by an anabolic process (Ladd Franklin) which is reversed by katabolism of the same process. It is true that colors of extremely high intensities produce a sensation of gray (katabolism) and that the fusion of complementary colors produces gray.

Hue is the cone reaction to a specific wave

length. Saturation is the absence of foreign wave lengths in a hue and refers to the spectral purity of the color. Luminosity (yellow) is an intensity value either depending on rod-cone balance in dim light or to a katabolic hue change in the direction of the elemental gray and away from specificity. In the study of color vision certain terms are used which will be enumerated as follows:

Trichromatopia. All hues may be obtained by the physical admixture of bluish-red, green and violet. (Toned by yellow, black and white.)

Dyschromatopia. Defective color perception. It is hereditary, occurs more frequently in males and is transmitted by the female. An acquired form is occasionally seen in certain ocular and systemic diseases.

Achromatopia. Total color defect usually accompanied by albinism and nystagmus. May be due to the congenital absence of the secondary chromatic factor of the cones.

Dichromatopia. All color sensations produced by the admixture of two colors.

Protanopia. Red defect with neutral band at blue-green (492).

Deutanopia. Green defect with neutral band at red (502).

Tritanopia. Blue defect with neutral band at yellow-green (570).

In the study of retinal function it is to be remembered that the image of an object viewed appears in reverse form on the retina so that objects to the right activate the nasal half of the right retina and vice versa. Similarly an object above is perceived by the lower half and an object below is perceived by the upper half of the retina. The extent of the peripheral or indirect fields of vision as measured on the perimenter with central fixation using a 10 mm. white test object at a distance of one-third meter is as follows:

	Out	(Degrees)		
		Up	In	Down
Form (white)...	90	55	60	70
Blue	80	50	50	60
Red	70	40	40	50
Green	60	30	30	40

Visual Acuity or the direct central form sense is the smallest visual angle at which the form of objects can be distinguished and is repre-

sented by the least distance between two objects at which they can be distinguished as two. The smallest visual angle or resolving power of the human eye is conveniently assumed to be an angle of one minute or a retinal image of about 0.004 mm. in diameter, and since the diameter of a retinal cone is approximately 0.003 mm. it is believed that there is a physiological relationship between the two and that two points can be seen separate only when they are large enough to cover more than one cone. The cone mosaic of the retina at the fovea is so arranged that two lines are seen as separate more readily than two points, and the minimum separable of two such lines is ten seconds of an arc and is known as the aligning power of the eye. The size of the retinal image varies directly with the size of the visual angle, which is determined by the distance of the object of regard from the nodal point of the eye. The visual acuity is measured by the ability of the eye to distinguish letters or figures, preferably of Gothic style, under an illumination of at least twenty foot-candles of white light; such letters being black on a white or gray background and of a size which subtends an angle of five minutes, each component block and separation thereof subtending an angle of one minute for the specific distance at which the letter or figure is placed from the nodal point of the eye. For testing purposes an adequate distance is twenty feet or six meters.

The Optic Nerve. The optic nerves terminate a short distance behind the globe at the chiasm which lies in the optic groove on the sphenoid bone which is in front of the infundibulum and above the hypophysis. In the chiasm the fibers of the optic nerve separate to form a semi-decussation with the following pattern, i.e., fibers from the nasal half of each retina (temporal visual fields) cross over to continue in the optic tract with fibers from the temporal half of each retina (nasal visual fields) which do not cross but continue back, in their original retinal relationship. It is thus apparent that from the optic chiasm back the right retinal halves (left halves of visual fields) are represented in the right half of the brain while the left retinal halves (right halves of visual fields) are represented in the left side of the brain. From the chiasm the optic tracts are conducted back around the crura cerebri to the primary optic ganglia (the external geniculi-

late body, the anterior corpus quadrigeminus and the pulvinar of the optic thalamus) where the fibers divide. The smaller portion of this division passes to the nuclei of the third cranial nerve (oculomotor nerve), thus establishing the pupillary reflex and movements of the ocular muscles. The larger bundle of fibers are concerned with visual impressions and pass through the posterior portion of the internal capsule and then fan out to form the optic radiation (fibers of Gratiolet) which terminate in the cortical ganglion cells of the mesial surface of the cuneus and the parts surrounding the calcarine fissure of the cerebral cortex (visual area). In this area nerve excitations become visual sensations and visual memories.

THE CONTENTS OF THE GLOBE

The Vitreous. The vitreous is a transparent gel filling the larger chamber of the globe situated behind the lens. It is slightly condensed towards the periphery and contains the hyaloid canal which runs in an antero-posterior direction and which encloses the hyaloid artery during fetal life. The canal serves as a posterior fluid passage and the vitreous gel forms a slightly compressible bulk which fills out the larger chamber of the globe helping to maintain its internal pressure.

The Aqueous. The iris divides the aqueous into an anterior and posterior chamber. The iris angle is formed by the junction of sclerocorneal margin, the root of the iris and the ligamentum pectinatum whose elastic laminae are covered by an extension of posterior corneal endothelium, thus forming spaces which are continuous with the cavity of the aqueous (spaces of Fontana). At the sclerocorneal junction Schlemm's canal communicates laterally with the anterior ciliary veins. The aqueous humor is a nutrient fluid secreted by the ciliary process into the posterior chamber and carried by convection through the pupil to the anterior chamber leaving the eye through the spaces of Fontana and Schlemm's canal into the anterior ciliary veins. The posterior fluid passages include the hyaloid canal and to the vortex veins via the suprachoroidal space and Tenon's space. The intraocular pressure is the result of the ratio of aqueous secretion (dialysis?) and drainage and remains fairly constant at a normal figure of 25 mm. Hg.

The Lens. The crystalline lens is suspended

in its transparent capsule behind the iris by two ligaments attached to the ciliary body. It is formed by accretion of successive concentric lamellae to a biconvex transparent body 5 mm. thick and 9 mm. in diameter. The function of the lens is to focus divergent rays of light on the retina which is effected by a total increase of convexity brought about by the contraction of the ciliary muscle which draws the choroid forward and relaxes the suspensory ligament of the lens, thus diminishing the tension of the lens capsule and allowing the lens to form a more convex shape (Helmholtz), or the ciliary contraction increases the tension of the ligaments, bulging the lens forward anteriorly at the center (Tscherning). Regardless of the mechanism an increase of convexity is obtained which is dependent upon the elasticity of the lens fibers and is termed accommodation. When this elasticity is decreased, as it is in old age to a very appreciable extent, divergent rays are not readily brought to a focus and objects at near distances are not seen clearly (presbyopia). In the study of accommodation the following terms are used and the appended table illustrates the loss of accommodation with advancing years.

Far Point. The farthest point of distinct vision with the accommodation relaxed. In the normal eye this is at infinity.

Near Point. The nearest point at which the eye can see distinctly when employing its maximum accommodation.

Range of Accommodation. The distance between the far point and the near point.

Diopters of Accommodation. The convex lens value which it would be necessary to place before the eye to take the place of the accommodation for the near point. The focal length of a one diopter lens is 100 centimeters or one meter.

Amplitude of Accommodation. The difference in diopters between the refractive power of the eye at rest and when accommodation is exerted at its maximum.

AC equals 100 divided by NP in cm.

Relative Accommodation. The dioptric amount that accommodation may be relaxed (negative) or augmented (positive) while fixation at a certain convergence distance is maintained. This illustrates the existence of a certain elasticity between accommodation and con-

vergence and is equally true of the latter function.

TABLE OF ACCOMMODATION AMPLITUDES
AND NEAR POINTS

Age yrs.	Amplitude D	Near Point cm.
10	14.00	7.0
20	10.00	10.0
30	7.00	14.0
40	4.50	22.0
50	2.50	40.0
60	1.00	100.0
70	0.25	400.0 (Duane)

OPTICAL CONSIDERATIONS AND MOTILITY OF THE EYE

While all ether vibrations travel at the same rate they differ from each other in wave length so that while the rate of propagation remains constant the number of vibrations per unit of time differs. The range of known ether vibrations from the shortest wave length of 0.004 millimicrons (one millimicron equals one one-millionth of one millimeter), which is known as the cosmic wave of Millikan, to the longest radio or Hertizian waves, measuring seven kilometers to 100,000 millimicrons, traverses seventy octaves, of which only one octave (760 to 380 millimicrons) is perceptible to the human organ of sight.

It was previously mentioned that the cornea refracts divergent light rays entering the eye so steeply that rays originating from a point six meters distant can be considered parallel in the sense that they are exactly focused on the retina after traversing the refractive media (cornea and lens) without additional focusing effort on the part of the lens, providing the eye is normal (emmetropic). It can be stated, then, that in the emmetropic eye light rays from a point recedes to forty centimeters or beyond, upon the retina when the eye is at rest and the accommodation relaxed. Divergent rays originating from a point closer than six meters will require additional focusing and this is effected by an increased convexity of the lens mediated through the ciliary muscle in the act of accommodation as described before. When fibrosis of the lens progresses to the point where its focusing ability decreases so that the near point recedes to forty centimeters or beyond,

presbyopia has arrived and the individual will experience difficulty with near vision. The focusing power of the lens is readily understood when we consider the optical fact that when light rays enter a prism (a triangle of glass base down) they are bent or deflected towards the base. Now if two prisms are placed so that their bases are in apposition it is apparent that entering light rays are bent towards each other (focused) until they meet at a point (principal focus). This is the shape of a convex lens and the shape of the crystalline lens of the eye which alters its principal focus by altering the amount of convexity, which is the same as increasing the width of the base of a prism.

If the indices of curvature of the refracting media are less than normal, or if the antero-posterior diameter of the globe is less than normal, parallel rays entering the eye at rest will focus behind the retina and hypermetropia results. The eye tries to compensate by accommodating and may do so, in which case vision is maintained with effort which may cause fatigue (asthenopia), or if the goal is beyond the accommodative power the latter relinquishes its effort with the result that accommodative strain is avoided but the visual acuity for distance is decreased. If the indices of curvature of the refracting media of the eye are greater than normal or if the antero-posterior diameter of the globe is greater than normal or if the indices of refraction of the refracting media are increased (sclerosis), and if the lens fibers become swollen (cataract), parallel rays will be focused in front of the retina, and since accommodation cannot compensate by diverging light rays, distant visual acuity is proportionally decreased and the condition of myopia results. The individual compensates somewhat by holding objects closer to the eye, thus diverging incoming rays by approximating his fixation to suit his needs. In employing the term "normal" in the above discussion it must be remembered that, strictly speaking, an absolute normal does not exist, so the referred "normal" must be taken to mean the focusing norm of the individual eye which focuses rays from a distance of six meters and beyond exactly on the retina without accommodative effort.

When the indices of curvature of any of the refracting surfaces of the eye are greater in one meridian than the other it is apparent that the

opposite meridians will be focused on planes of a different level, so that one meridian may be focused on the retina but its opposite will not, so that distortion will result and the condition of astigmatism is present. So far as is known the lens is unable to accommodate sectionally, so the condition is not compensated for and visual acuity is decreased. The asthenopia which very frequently accompanies even small amounts of astigmatism may be explained upon the basis of an abortive attempt to compensate by accommodative effort or upon the basis of fusion difficulty, or both. Irregular astigmatism is a distortion of the image produced by a localized irregularity of a refracting surface as, for example, that caused by the scar resulting from a corneal ulcer. Irregular astigmatism usually causes grave visual defects and, of course, is not compensated for by accommodation. Anisometropia is a term applied to mean a difference in kind or degree of refractive error of one eye as compared to its fellow. Since accommodation is the same in both lenses it is apparent that compensation will be attained, if attained at all, in but one of the eyes (usually the most emmetropic eye) and that asthenopic symptoms will not only be accommodative in nature but fusional as well, as the images formed will show some disparity.

Under normal conditions both eyes are concerned in the act of vision, and when an object is fixed the eyes involuntarily assume a position so that the object is focused on the macula of each eye and more peripheral rays are focused on corresponding retinal points. The blending of the two images into a single mental percep-

tion is termed fusion, a faculty acquired soon after birth and usually well developed by the end of the sixth year of age. The act of fixation or looking at an object may be voluntary or reflex, but the neuromuscular act providing for singular binocular vision is reflex just as accommodation and convergence are reflex. We have seen that objects are projected in reverse order on the retina so the upper field falls on the lower retina, the inner field on the outer retina and so on. By reversing this process we learn by experience to judge the location of an object by placing it at the extremity of an imaginary line drawn from the retinal image through the nodal point of the eye (projection).

Normally both eyes move simultaneously and so conjoined that the images of an object always fall on corresponding retinal areas. Ocular movements may be described as rotations around a vertical (abduction-adduction), a transverse (supraduction-infraduction) and an antero-posterior (torsion) axis whose center of rotation is about the center of the globe. These conjugate movements of the eyes are effected by the action of the six extraocular muscles attached to the globe and anchored at the orbital planes. The complex rotations involving a fine balance between action and brake action (check) is regulated and governed by neural centers of association. In every movement of the eyes several muscles of each eye act simultaneously but the field of action of an individual muscle is considered that direction of gaze in which its action is greatest. The following table summarizes the extraocular muscles, their nerve supply, their primary and their subsidiary actions:

<i>Muscle</i>	<i>Nerve</i>	<i>Primary Action</i>	<i>Subsidiary Action</i>
External rectus	6th	Abduction (out)	None
Internal rectus	3rd	Adduction (in)	None
Superior rectus	3rd	Supraduction (up)	Adduction-intorsion
Inferior rectus	3rd	Infraduction (down)	Adduction-extorsion
Superior oblique	4th	Infraduction (down)	Abduction-intorsion
Inferior oblique	3rd	Supraduction (up)	Abduction-extorsion

Somewhat different from the above outlined yoke movements of the eyes and effected by the simultaneous action of the internal recti muscles in association with accommodation we are able to rotate each eye inward when fixing objects at close range. This constitutes the act of convergence and is measured by the meter angle

one unit of which is the angle formed by the visual line with the median line at a distance of one meter. Thus when an individual fixes an object at a distance of one meter, each eye accommodates one diopter and converges one meter angle (normally). While the association of accommodation and convergence is intimate

in the fixation of near objects in order to enable us to see these objects both clearly and singly, it is not, however, inflexible, and accommodation can act separately, as we have seen, and so likewise can convergence, such action being termed relative convergence—positive when it increases and negative when it decreases beyond the fixed value for the distance involved.

Fusion, or the mental blending of two images as one, depends upon the integrity of the afferent arc of the visual reflex, the integrity of the coordinating centers and the efficient or normal operation of the efferent neuro-muscular arc. The first requires that two similar and clear images reach the brain and this, in turn, depends upon clarity of the refractive media, freedom from high and dissimilar refractive errors and normal neural conduction to and through the centers. The second requires an efferent neural pathway free from disease or abnormality and functionally efficient muscles so placed that the posture of the eyes is within the range or amplitude of fusion. When any of these conditions do not prevail the retinal images of an object do not fall upon corresponding retinal areas and double vision (diplopia) results. Eventually one of the images becomes mentally suppressed, and the eye in which the image is suppressed deviates from parallelism and moves with its fellow dysjunctively. This latter phenomenon is termed strabismus, squint or heterotropia. It is further differentiated into paralytic strabismus when the efferent neural pathway or individual muscle is affected by dis-

ease or injury, and concomitant strabismus when the afferent pathway or muscular posture is involved. Fusion, or the desire to see singly, is tenacious when once acquired and serves to further orient the eyes into exact binocular alignment over and above that supplied by the neuro-muscular postural tone, much in the same manner that accommodation supplies the extra focusing power over and above that supplied by the static cornea required to focus a sharp image on the retina so that we are able to satisfy our demand to see clearly. The exercise of each function in the overcoming of handicaps results in compensation with strain and fatigue, while failure to overcome the handicap results in a loss of clarity on the one hand and diplopia with the final dysjunction of an eye on the other. The fusion power may be roughly assessed by allowing the eyes to overcome an artificially produced diplopia by employing prisms (ductions) and by measuring stereopsis and comparing it with a standardized norm. This latter test rests upon the fact that true depth perception (perspective) is produced by the fact that the two eyes regard an object from slightly different angles (interpupillary distance of about 64 mm.) and the supposition that when the fusion faculty is well developed one's stereoscopic perception is proportionally high. It is true, of course, that stereopsis is lost when one eye suppresses even momentarily.

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FEEBLE-MINDEDNESS (MENTAL DEFICIENCY).—Mental deficiency is a condition or state characterized by mental and social inadequacy resulting from arrested or incomplete mental development. The term is used also to refer to the field of interest centering upon the study, training and care of those who are mentally defective. Conditions involving behavioral, mental and emotional disorders of other than developmental origin until recently have received little attention from psychologists and are generally considered as almost wholly within the province of the medical sciences. Mental deficiency, on the contrary, has been long regarded as within the province of psychologists who thus have been in a position to make, and have made, many contributions to its study. From the field of mental deficiency, in turn, have come contributions to our knowledge of general psychology. Mentally defective subjects have afforded unique opportunity for investigation of specific psychological problems, exploited chiefly in studies of intelligence and mental development. Foundations for present-day clinical psychology were laid by those who first undertook application of psychological methods to the study of the mentally deficient. Psychological work in mental deficiency has contributed importantly to the field of tests and measurements, and has in many instances had a significant influence upon instruction and organization within university departments of psychology. Results of research with mental defectives have also influenced thought and research in other fields, especially that of normal child development.

Knowledge of the more general features of mental deficiency is prerequisite for appreciation of the psychological material which this condition presents. Although an extensive literature is available, it is widely scattered. A considerable portion of this report, therefore, is devoted to a survey of general features (terminology and definition; history; systems of classification; incidence, causation and control; treatment, care, training and supervision). Not

only is this important as background, it also represents much material contributed by psychologists, sometimes incidentally to other work.

GENERAL FEATURES

Terminology and Definition. The condition of mental deficiency (Ger. Schwachsinn; It. deficiencia mentale; Fr. débilité mentale;) has also been called in English *idiocy*, *imbecility*, *feeble-mindedness*, *amentia*, *mental subnormality*, *hypophrenia* and *oligophrenia*. At one time considerable confusion arose because *feeble-mindedness* was used in the United States to include all degrees of mental defect, while in Great Britain the term referred only to the less pronounced conditions of those called "morons" in America. *Amentia* has been used more widely in England than in the United States, while *hypophrenia* and *oligophrenia* are not yet generally accepted terms, though the latter is now found increasingly in the medical literature of both countries. *Idiocy* and *imbecility*, on the other hand, are no longer used as generic terms, though both have been retained in English as in the European languages, the former to designate the extreme degree of defect, and the latter the next less severe degree. *Mental subnormality* occasionally used to designate the entire range of mental deficiency, generally refers to conditions found among those who are called high grade, or borderline, defectives, or to children who are "backward," or "retarded," but not truly defective. An arbitrary distinction is commonly made between the higher grade subnormals and the "true defectives," idiots, imbeciles, and low grade morons who require either permanent or temporary custodial care. It is recognized, however, that mental deficiency in the sense of limited intelligence is common to the individuals of both groups though in differing degrees.

Definitions of mental deficiency have been formulated in the fields of medicine, psychology, law, education and social welfare. Each formulation tends to emphasize particular aspects of the condition or the problems it presents to the field in question. A definition given

by Esquirol is said to have been the first clear definition of "idiocy" and has not been surpassed since his time.

"Idiocy is not a disease, but a condition in which the intellectual faculties are never manifested; or have never been developed sufficiently to enable the idiot to acquire such amount of knowledge as persons of his own age, and placed in similar circumstances with himself, are capable of receiving. Idiocy commences with life, or at that age which precedes the development of the intellectual and affective faculties, which are from the first what they are doomed to be during the whole period of their existence."

The following definition is given in the English Mental Deficiency Act of 1927:

"Mental defectiveness means a condition of arrested or incomplete development of mind existing before the age of eighteen years, whether arising from inherent causes or induced by disease or injury."

Widespread use in the United States of the Binet-Simon intelligence test method and acceptance of a theory of mental deficiency as a quantitative deviation, i.e., the condition characterizing the low end of the curve of distribution of intelligence, have contributed to definition of mental defect in terms of Mental Age and Intelligence Quotient. In 1910 the American Association for the Study of the Feeble-Minded defined the various levels of mental defect in terms of mental age, considering a mental age of 12 years at maturity the lower limit for the non-defective population. Later an I. Q. of 69 (mental age 11 years at maturity) was accepted as the upper limit for mental defectiveness and this is still specified in the laws of New York State and of some other states as a criterion for commitment to an institution for defectives. The figure, 70 I. Q., is frequently cited as a point of demarcation between the defective and non-defective populations even though clinical findings have demonstrated that at the borderline level an intelligence quotient, alone, is insufficient for establishing the condition of mental deficiency. Moreover the percentage of the population which would be considered defective by this criterion is far in excess of any reasonable estimate of true amentia.

A broader formulation, but offering no specific criteria, appears in the *Statistical Manual for Use of Institutions for Mental Defectives*.

"The condition of mental deficiency, or the diagnostic mental status, is to be determined by a combined consideration of all clinical data relating to the patient, that is, his present mental condition as to intelligence level and emotional reactions in relation to his anatomical, physiological and neurological constitution; his general behavior and social adjustment; his background in biological and social heredity; and his genetic developmental history, including particularly events affecting his physical, social and emotional development. In short, all those data which are necessary in order to evaluate the present status of the individual."

There are two conditions with which mental deficiency may easily be confused. The first is simple subnormality. The distinction between socially inadequate individuals of low intelligence and those of the same intelligence level who are capable of "managing themselves and their affairs," and do not require "care, supervision or control for their own protection or for the protection of others" is primarily social and calls attention to the over-all nature of the condition of mental deficiency. This appears clearly in the social criterion of defect accepted in Great Britain. At younger ages, before social competence is established, test results have offered an alternative criterion, and these are now being increasingly used.

Secondly, mental deficiency should be differentiated from those deviations from the normal found in mental disease or psychosis. Deficiency is frequently confused with certain psychotic states because of behavioral similarities as well as somewhat superficial correspondence in the legal, medical, and social aspects of the problems presented by the two groups. Indication of retarded mental development (determined by study of the developmental history) is the distinguishing feature of the mentally defective, and usually constitutes the basis for differential diagnosis. Though distinct medical and psychological conditions, mental defect and mental disease are not mutually exclusive and there is good evidence that a close relationship does exist between them. Nearly every form of mental illness has been found among defectives and the incidence of psychoses in individuals of sub-average intelligence is so high as to have led to the suggestion of special susceptibility to mental disease among those who are intellectually subnormal.

HISTORY

The earliest records of attention to the mentally defective include: the Therapeutic Papyrus of Thebes in 1552 B.C., (considered the first account dealing with the care of mentally subnormal children); a report by Juan Pablo Bonnet, a physician of Madrid who, in 1620, undertook the education and physical rehabilitation of a mentally defective deaf-mute; and the teachings of Boerhaave at the University of Leyden, Morgagni of Padua, and Haller of Göttingen all of whom in the 18th century instructed their students in mental deficiency. Scientific interest in mental deficiency is considered to date from the work of the young French physician, Itard, whose efforts to educate "the savage" or "wild boy" captured when eleven or twelve years of age in the woods of Aveyron and diagnosed by Pinel as an "idiot," were officially reported in 1801 and 1806 and excited wide interest.

Itard's detailed reports of his painstaking, ingenious, exploratory studies of the defective boy, Victor, have become a classic in the literature of clinical psychology, education and mental deficiency. There has been little recognition, however, that many of the procedures employed by Itard (such as, for example, serial exploration, recognition, and paired association) anticipated methods later identified with the early psychological laboratories. Itard's pupil, Séguin, elaborating upon his predecessor's system of "medical education," published in 1846 his *Traitément Moral Hygiène et Éducation des Idiots et des autres Enfants Arrières*, known as one of the first psychological contributions to the study of the idiot and imbecile. Séguin's "physiological method," based on the theory that "the education of the senses must precede the education of the mind," consisted in the main of carefully prescribed courses of sense and habit training. His teachings set the pattern for a group later referred to by Binet as "clinicians who have made . . . a vague pedagogy adorned with the pompous title of the medico-pedagogical method."

The zeal of Séguin (better known to the psychologists today for the Séguin Form Board than for his writings) found a second avenue for expression in the founding of schools for the training of defectives. After establishing the first successful institution of its kind in Paris

in 1837, he emigrated in 1850 to America, where he became associated with Samuel Howe (teacher of Laura Bridgeman) and other pioneers of the American movement to provide for the mentally deficient. The first schools for defectives in Germany, Switzerland, and England had been established in 1842. In the United States, Massachusetts opened the first state-supported school in 1848, and by 1876, when the "Association of Medical Officers of American Institutions for Idiots and Feeble-minded Persons" held its initial meeting with Edouard Séguin as president, there were twelve such institutions in the United States.

Two circumstances favored the development of institutions. The first was the discovery that no amount of training would make the idiot self-supporting. The second resulted from early studies by Goddard and Davenport emphasizing the importance of heredity in transmission of the higher grades of mental defect, and the relationship of this condition to pauperism and crime. Communities were encouraged to protect both society and the individual defective. By 1917 institutional care was provided by all but four states. Between 1890 and 1942 the number of feeble-minded and epileptic persons in public institutions in the United States increased from 4,001 to more than 105,000. This increase, though attributable in part to the general increase in population, is due chiefly to an increase in institution facilities.

The introduction of the Binet-Simon scale into America by Goddard, Huey, and Kuhlmann began a new era. Fernald, long a leader in the study of mental deficiency, considered that "the theory and practice of mental testing and the discovery of the concept of mental age did more to explain feeble-mindedness, to simplify its diagnosis and to furnish accurate data for training and education than all the previous study and research from the time of Séguin." Among the diverse and far-reaching effects of the use of the intelligence tests between 1910 and 1925 was the immense widening of the field of academic psychology to include clinical and applied psychology.

A research department, organized for psychological studies in mental deficiency, service to the institution, and the training of psychologists for clinical work, was established at the Training School at Vineland, New Jersey, in 1906. This department, under the leadership

successively of Goddard, Porteus, and Doll has made steady contribution to the fields of mental deficiency and psychology. It has also set a pattern for the organization of similar departments (but with programs varying in emphasis) in other institutions, including Letchworth Village of the New York State Department of Mental Hygiene, the Wayne County Training School in Michigan, the State School at Wrentham, Massachusetts, and the recently opened Training School at Southbury, Connecticut.

The mental testing program of World War I and the widespread introduction of group tests into school systems brought to public attention the problem of the higher grade subnormal groups. As a result, the field of mental deficiency has come to be roughly subdivided into two areas of interest. The first centers about problems of those of lower mentality, the "true defectives," of whom a considerable percentage are to be found in institutions. The second is concerned with the high-grade and borderline groups remaining largely within the general population. Of the latter group, only a small fraction are institutionalized, and those often for short periods only. The two areas differ widely as to medical, legal, biological, educational, social and psychological importance, although there is no clear dividing-line between them.

The major developments of the past decade have been the increase of interest in medical and biological study of specific clinical types on the one hand, and increasingly extensive psychological study of, and provision for, the numerically and socially more important high grade group on the other.

CLASSIFICATION

Three systems of classification of mental defectives are in common use at present. (1) Psychological and social classification as to intellectual grade or level (idiot, imbecile, moron or feeble-minded, and borderline). (2) Medical classification as to clinical type (familial, mongolian, cretin, hydrocephalic, etc.). (3) Etiological classification (hereditary and acquired, or primary and secondary, or, more recently, endogenous, exogenous and mixed). Institution populations are ordinarily classified as to level and clinical type, and occasionally as to etiology. The relative clinical importance or scientific value of the different classifications varies with

the condition and the problems connected with the particular case.

Classification according to level. Definitions of the *idiot*, *imbecile* and *moron* levels in terms of mental ages were formulated by the American Association for the Study of the Feeble-minded in 1910, with designation of I.Q. limits for each group added in 1920. Until 1934 the Stanford Revision of the Binet Scale (1916) was specified, with 16 years as the divisor for chronological ages beyond 16. No mention of any specific test appears in the 1941 edition of the Statistical Manual for Institutional Use, but the following definitions are given:

"An *idiot* is a mentally-defective person usually having a mental age of less than 3 years or, if a child, an intelligence quotient of less than 20."

"An *imbecile* is a mentally-defective person usually having a mental age of 3 years to 7 years, inclusive, or, if a child, an intelligence quotient from 20 to 49, inclusive."

"A *moron* is a mentally-defective person usually having a mental age of 8 years or upwards, or if a child, an intelligence quotient of 50 or more. As a rule the upper limit for a diagnosis of mental deficiency should be an intelligence quotient of 69, but this limit should not be adhered to in cases where medical, social and other factors clearly indicate that the patient is mentally defective. The term 'moron' includes all mental defectives above the grade of imbecile."

In England the definitions of the *idiot*, *imbecile* and *moron* levels, legally established by the English Mental Deficiency Act of 1927, are based upon social competence. According to these definitions:

Idiots are "persons in whose case there exists mental defectiveness of such a degree that they are unable to guard themselves against common physical dangers."

Imbeciles are "persons in whose case there exists mental defectiveness which, though not amounting to idiocy, is yet so pronounced that they are incapable of managing themselves or their affairs, or in the case of children, of being taught to do so."

The *feeble-minded* are "persons in whose case there exists mental defectiveness which, though not amounting to imbecility, is yet so pronounced that they require care, supervision, and control for their own protection or for the pro-

section of others, or, in the case of children, that they appear to be permanently incapable by reason of such defectiveness of receiving proper benefit from the instruction in ordinary schools."

Thus the definitions in use in the United States are primarily in terms of standardized measures while the English definitions are in terms of important everyday adaptation to the physical and social environment. At the two lower levels the criteria parallel each other closely; at the upper level both are more flexible and more open to local interpretation.

Within each level the range of mental ability is large, the terms high-grade and low-grade being frequently employed to indicate relative position within a particular level. It follows that a low-grade imbecile and high-grade idiot may be more nearly similar in mental capacity than two imbeciles of whom one is low-grade and the other high-grade. When the degrees or levels of defect are thought of as arbitrary subdivisions of a continuum, the tendency to establish artificial distinctions is less obscured. Furthermore, it has repeatedly been shown that groupings based solely upon the composite test score of a Binet examination do not entirely correspond to groupings based on other equally reliable psychological test measures. Classification according to level is a useful tool but it is not a satisfactory basis for comparative scientific studies, although in the past it has been frequently so employed.

For practical purposes a rough classification into low-grade defectives and high-grade defectives has long been used. The former group includes those requiring custodial care, viz., all idiots, nearly all imbeciles, and some low-grade morons who, because of severe physical disabilities, or great emotional instability, are unable to function at their intellectual level and require long-term or permanent institutionalization. The high grade defectives include those with less severe intellectual subnormality in combination with social inadequacy or clinical conditions not sufficiently serious to necessitate long institutionalization but often requiring prolonged supervision, specialized training, or temporary institutional care. A small percentage of those who are intellectually "moron" or "borderline" moves in and out of institutions, constituting a group of "marginal" defectives whose need for supervision or care largely de-

pends upon, and varies with, the conditions of the families and communities in which they live. Some have questioned whether this high-grade group should ever be classified as "defective." Goddard, who introduced the term moron, suggested that the upper limit of feeble-minded had been placed too high and that the "real limit" might better be a mental age of seven years than twelve years. "It is pretty generally accepted that no amount of training of the best kind we know, can make a person of only seven-year mentality capable of filling even a small place in the social group. This would mean that there are two groups of the feeble-minded, not three. There are idiots and imbeciles. The morons comprise that large group of people whom we recognize as of dull intelligence who never live sumptuously or manage themselves or their affairs with a high degree of prudence, but nevertheless do manage themselves; and, if carefully and wisely trained, are not a burden in the community." Any "limit" in terms of a single criterion will undoubtedly always prove indefensible however necessary for social and legal purposes some specification of limit may be.

Classification according to Clinical Type. Classification of mental defectives as to clinical type is determined largely by physical characteristics, family history, or medical and laboratory findings. Though receiving little attention from psychologists, clinical classification is increasing in scientific importance as clinical conditions are more intensively studied. Among the more frequent identified types in approximate order of incidence, according to institution admissions in New York State, are: *familial mental deficiency; mongolism; post-traumatic conditions; post-infectious conditions* (including both post-meningitic and post-encephalitic amnias); *with developmental cranial anomaly* (including microcephaly, oxycephaly, and hydrocephaly); *with other organic nervous disease; and due to epilepsy.* Idiots savants are sometimes considered a clinical type. Cases for which no clinical classification can be made are commonly called "*undifferentiated.*" This is the largest single classification, and includes nearly half the institutionalized defective population. Textbooks on mental deficiency and the medical literature give detailed descriptions of the known clinical types though only about 25 per cent of the institutionalized defectives (and these chiefly

in the low-grade groups) can be classified as other than "familial" or "undifferentiated."

Also of clinical importance and in addition to specific clinical types, there are partially recognized and explored relationships between mental deficiency and neuropathic ancestry, convulsive disorders, syphilis, glandular dysfunction, and special sensory or motor defects, all of which may occur independent of, or in association with, low intelligence. In the case of a particular defective individual, as well as from the standpoint of research, the importance of clinical classification is proportional to the available knowledge regarding the clinical type in which the individual is classified. For psychology the classification into clinical types will become increasingly important as more refined methods for study of mental functioning, together with more adequate knowledge of underlying pathology and deviating organic conditions, provide opportunity for exploration of possibly concomitant processes.

Classification According to Etiology. The earlier classification into *hereditary* and *acquired* mental deficiency was supplanted by Tredgold's introduction in 1908 of the terms *primary* and *secondary*, the former designating all cases of mental defect "the cause of which is intrinsic, endogenous, or germinal," the latter designating "those cases which are extrinsic or exogenous in origin, that is to say . . . the result of some adverse factor of the environment acting upon the offspring at any stage from the fertilization of the ovum up to the time at which the development is complete." This classification has been useful especially for prognosis and provisions for training and care. In general, secondary or exogenous amentia is more frequent in low-grade cases and primary or endogenous amentia more frequent among high-grade cases. Strauss and Werner have recently made use of a classification into *endogenous*, *exogenous*, and *mixed groups*, strictly defining the first two groups for purposes of scientific study. Lewis, in England, has proposed a classification into *pathological amentia* and *sub-cultural amentia*, the latter comprising cases that represent extreme deviation at the lower end of the normal distribution curve of intelligence, the former, cases due to pathological conditions. This also, in effect, corresponds roughly to a grouping into low-grade and high-grade cases. The classification is not widely used and has

been criticized on the ground that a number of cases can be included in both categories.

INCIDENCE, CAUSATION, AND CONTROL

Questions as to incidence, causation and control of mental deficiency have been approached through study of accumulating records of identified mental defectives and their family histories, through population surveys, and through scientific study of specific clinical types. There are very few conclusive answers, but specific problems have become more clearly defined as the heterogeneous character of the field has been increasingly recognized.

Incidence. Surveys made in the United States and the British Isles to ascertain the over-all incidence of mental defect have given varying figures. The differences are attributable to differences in methods of securing data (questionnaires, house to house visits, school records or census reports), in criteria of defect (test results, academic retardation, institutionalization), and in inclusiveness or representativeness of the population studied. In 1926 Lewis concluded, on the basis of a survey in England and Wales of a population of 662,880, that the incidence of mental defect was 8.57 per 1,000. This was nearly double the estimate from a similar survey in 1904 and higher than the figures given by state and local surveys of the same period in the United States which varied between 3.4 and 7.3 per 1,000. The United States draft boards of World War I reported that 9.24 per 1,000 were thought to be mentally defective. Studies to determine racial or national differences in incidence of mental defect have been inconclusive except for indication that the occurrence of low-grade intellect is more common among Negroes than among whites. Mental defect is regularly found to be slightly more prevalent in rural than in urban areas. At lower levels there is a slight predominance of males, at higher levels, of females. A conservative estimate for over-all incidence of mental defect among the adult population of the United States is 1 per cent.

Surveys of younger age groups show a higher incidence of mental defect than do surveys of adult populations, due in part to the relatively early death of many defectives, and in part to differences in criteria of defect at different ages. MacMecken in a careful study of the intelligence of a representative group of ten-year-old

Scottish children found 1.26 per cent with I.Q.'s below 70. A statewide survey by the Connecticut State Department of Education in 1940 reports 2.5 per cent of the children between four and sixteen years, exclusive of those in institutions, to be "mentally handicapped to the extent that special educational provisions are necessary to meet their needs." General estimates of defectives in the public school population place the incidence between 2 per cent and 3 per cent.

Within the mentally defective group the incidence varies inversely with the degree of defect. Of all defectives not more than 5 per cent are idiots and less than 20 per cent are imbeciles. The remainder are morons. As previously stated, incidence varies also with clinical type. Tredgold estimates the incidence of mongols at all ages at 5 per cent, but considers that of children diagnosed as mentally defective before one year of age 50 per cent are mongols, and of those diagnosed before five years of age 25 per cent are mongols. Many clinical conditions, including those due to recessive genes, are of rare occurrence. For example, Jervis identified 200 cases of phenylpyruvic oligophrenia after examination of 20,000 mental defectives. Incidence is highest for "familial" mental deficiency. Over 30 per cent of the defectives admitted to the New York State institutions are so classified and the percentage of the total defective population falling within this group would be far higher.

Causation. Early studies by Goddard and Davenport of the familial incidence of mental deficiency led to the conclusion that defective germ plasma was responsible for two-thirds of the cases. More recent estimates give figures for the incidence of primary mental deficiency varying from 75 per cent to 90 per cent (Tredgold, Wildenskov). Penrose is more conservative and reports that careful study of 513 institutional cases showed that only 29 per cent could be unquestionably attributed to genetic causes, and only 9 per cent to secondary causes. The remaining 62 per cent he considered "unclassifiable" due to the difficulty of "extricating from one another" the effects of environment and heredity. During the past decade interest in causal factors in mental deficiency has led to accumulation of data from many sources.

Important known causes of secondary or exogenous mental deficiency include encephalitic and meningitic infections, birth trauma, epi-

lepsy, syphilis and sensory deprivation. Mongolism is generally considered exogenous though the causal factor is not established. The probability of mongol births increases steadily with advancing maternal age (Bleyer, Myers, Benda). To establish secondary, environmental, or exogenous origins of defect, it is necessary to investigate such conditions as: ordinal position at time of birth; relationship of births of defectives to miscarriages and still births; presence of syphilis or alcoholism in the parents; diseases of the mother during pregnancy; birth trauma; and post-natal disease or trauma.

To establish endogenous origin of mental defect requires investigation of the incidence of defect in relation to consanguinity of parents, and the distribution of the condition among ascendent and collateral relatives. Understanding of the mechanism of inheritance has been furthered by studies of twins (Rosanoff, Kallman), study of ratio of defective offspring of specific clinical types to non-defective siblings (Sjögren, Penrose, Jervis), and comparison of the intelligence of siblings of children of different intellectual levels (Roberts). Statistical investigation of data has been used to study such various possible mechanisms of transmission as dominant, complementary dominant, sex-linked, recessive, or multifactor, genetic determinants. It has been found that phenylpyruvic oligophrenia, gargoylism, and amaurotic idiocy (both juvenile and infantile forms) appear in accordance with the expectation for a Mendelian recessive. Cases which are clinically classified as familial, either on the basis of recurrent defect for successive generations or a high incidence of mental defect in the offspring of known defective parents, are considered hereditary even though no mechanism of transmission has been established.

Either or both endogenous and exogenous factors may be causal in cerebro-spastic diplegia or paraplegia. This condition was long considered by some authors to be a result of birth injury alone. Cretinism, due to thyroid deficiency, may result from hereditary deficiency. It may also occur with or without environmental lack of iodine in the diet or with some pathogenic water supply. Hydrocephaly, which may follow an infectious process, is classified clinically with microcephaly as a cranial anomaly, though there are indications that microcephaly, in some instances at least, is of endogenous origin. In an undetermined proportion of cases,

defect of secondary origin has been superimposed upon an originally endogenous defect.

Control. In the field of mental deficiency "control" is used as synonymous with "prevention." Since the condition may result from a variety of causal conditions and circumstances, it follows that no single general program for control is indicated. In exogenous conditions, attempts at control must be directed to the specific causal factor. More adequate understanding and treatment of encephalitic or meningeal infections and other febrile conditions would undoubtedly reduce the incidence of a specific group of cases. Improvement in obstetrical practices and in ante-natal and early post-natal care would bring about further reduction. According to an estimate by Hogben, the number of mongols would be reduced to one-fourth the present number if childbearing were restricted to the period between twenty and thirty years. The largest single clinical group, familial mental deficiency, would be relatively unaffected by the foregoing measures. Cases of familial origin are less frequent among low-grade than among high-grade defectives. Moreover, since practically all idiots and many of the imbecile group are biologically sterile, the problem of transmission by these individuals is negligible. It is in relation to the high-grade and borderline defectives, where the familial type occurs most frequently, and among whom are found a considerable number of individuals "feebly-inhibited" as to reproductive drive, that the question of control is most often raised. Programs advocating sterilization have led to the enactment of sterilization laws in a number of states. Four states enacted such laws prior to 1910 and by 1940 sterilization had been legalized in thirty states. The laws differ widely in latitude, and in only twenty states had there been more than three hundred official operations prior to January 1, 1945. The State of California up to that date had sterilized 4,968 mental defectives and five other states have records of over one thousand operations each. Delaware and California rank first in the number of operations per 100,000 population. An alternative program has proposed segregation in institutions or colonies of mentally defective women of the familial type during the child-bearing period. This has been shown to be impractical because of the expense involved. A number of states, among them South Dakota, Massachusetts and Utah,

have undertaken state-wide registration of mental defectives, and some states have enacted laws prohibiting marriage of mental defectives. There is increasing social approval of efforts to identify families having records of a high incidence of mental defect in successive generations. Selective sterilization or segregation in extreme cases is widely advocated and frequently practiced. In general, however, geneticists and eugenicists are in fair agreement that the mechanisms of human heredity are as yet too little understood to warrant the introduction of any far-reaching program for genetic control of mental deficiency.

TREATMENT, CARE, TRAINING, SUPERVISION AND GUIDANCE

Mental deficiency as a condition is not a biological unit or entity. It consists in a lack of potentiality for development. Of itself it is not a disease. Except in cretinism, there exists no specific treatment or "cure." In cretinism the administration of thyroid, especially when begun at an early age, stimulates physical development, increases alertness, and in certain cases measurably promotes mental development. Cretins differ markedly, however, as to response to medication. Medical experimentation with other clinical conditions continues to some extent. Attention now is being directed chiefly toward providing care for the low-grade defectives, and training that will facilitate adjustment of those of higher grade, in the community if possible, and in institutions if necessary.

Low-grade defectives are more often institutionalized, but since institutions in the best equipped states provide for only one in ten of the defective population, the majority of the low-grade cases and nearly all high-grade cases remain in the community. Institution provisions for both groups have increased steadily; in New York State, for example, from 8.3 per 100,000 of the general population in 1884 to 109.7 per 100,000 in 1939. Provisions in different sectional areas of the United States vary greatly. Zubin, studying regional hospitalization rates for defectives and using the rate for the entire United States as a basis for reference found indices well above 100 for the New England, middle Atlantic, and north central states, whereas for the south central and the south Atlantic states the highest index was 53.7 and the lowest 39.5. The relative proportions of high-grade and low-grade

cases within any institution depend upon admission policies of the institution, community or state. In New York State about 50 per cent of the admissions are from the moron and borderline groups. The age difference between low-grade and high-grade defectives at the time of admission is indicative of the difference in problems they present. Of 965 consecutive admissions to New York State institutions nearly 60 per cent of those classified as idiot and over 40 per cent of those classified as imbecile were admitted at ages below eleven years. Of those classified as moron, 65 per cent were admitted at ages between ten and twenty years.

Institutions afford opportunity for observation of the general competence of the inmate population in a simplified and relatively standard environment. It has been found that idiots, except those of lowest grade, gain in ability to help themselves in eating and dressing if subjected to persistent training. The higher grade imbecile can learn to perform simple, routinized tasks under supervision. In many institutions the imbeciles contribute to the institution maintenance. Where there is a farm the boys assist in clearing land, feeding cattle, planting and harvesting vegetables. The girls learn bed-making, preparing of vegetables, and simple cleaning in kitchens and cottages. Habit training, if begun at an early age will establish personal orderliness, cleanliness, and simple forms of social behavior in all but the unstable or poorly adjusted members of the group. Academic achievement is negligible. Those who may be taught to recognize a few printed words can never progress to the point of making use of their accomplishment.

Work with the high-grade and borderline defective is rapidly becoming a distinct and specialized field. Problems presented by this group are of concern to school systems, social agencies, the field of industry, the courts, and institutions for delinquents and for lower grade defectives. The adjustment difficulties of the high-grade defective, who differs from the average individual in his greater need for special training and supervision have become the focus of a considerable area of clinical psychology. Here the work of the clinical psychologist includes: diagnosis of mental defect, determination of specific abilities and disabilities, making of recommendations with regard to admission to special classes, the investigation of

opportunities for special training, counselling of the individual defective and/or his parents, and possibly arranging for commitment to an institution.

Training of the high-grade defective. As the range of possible adjustment and maladjustment become greater, the potential effectiveness of environmental conditions is correspondingly increased, and the needs for training, supervision and guidance become more varied and insistent. Large numbers of high grade defectives brought up in fairly well-regulated and understanding homes in which they are given a measure of social protection, develop into self-respecting members of the community. They are able to perform simple but necessary tasks and achieve a fair degree of self direction. They ask for, and are willing to accept, advice. Many maintain themselves under ordinary conditions. It is because of those who fail to make adequate adjustment that there have been established diagnostic clinics, special classes, pre-vocational or occupational training, and other provisions for assisting the large number of morons and borderline defectives who remain in the community.

The educational requirements of this group differ greatly from those of the lower grades. Their possible academic accomplishments are more extensive. The fundamentals of reading and simple arithmetic can be used to some degree and the social demand for this achievement is recognized by them. Education at the elementary grade level should therefore emphasize development of the rudimentary skills. The modern school system, in addition to classes for slow-learning pupils, provides special classes for pupils of the borderline and high-grade defective groups. Such classes meet only the need of those of elementary school age. The high age limit for compulsory education now in vogue has aggravated the difficulties of the adolescent high-grade defective who is kept from employment by labor legislation and from profitable use of his time at school by his inability to enter high school or to find suitable training in the elementary school program. Progressive educational systems in several cities have recognized the need for an effective and practical educational program for the older pupils of the moron and borderline defective groups and have initiated educational and research programs centered about pre-vocational

and occupational training for subnormal pupils through the high school years.

COMMUNITY PROGRAMS FOR SUPERVISION AND GUIDANCE

Whatever his school or institution training, the high-grade defective ultimately becomes a member of the adult community with its occupational and social requirements. Until recently communities have taken little responsibility for the adjustment problems of their defectives. In large centers opportunities for vocational guidance and training have been occasionally available through the efforts of social agencies. In general, the adjustment of the individual defective depends upon the interest of his family and upon chance factors. In a rural community he may become a farm helper. In an urban environment he may secure a simple industrial or factory job or work as an unskilled laborer. Many defective girls enter domestic or laundry services, or take simple industrial jobs. Studies of mental age levels in industry have shown that workers with mental age levels as low as eight years can be successfully employed. During World War II it was found that some drafted men with mental ages of nine and ten years could be utilized in the service forces. Since work opportunities vary with general economic conditions, the defectives are able to find employment when labor is scarce, but when times are hard they are out of work and become dependent. Their limited resourcefulness and slow adaptation to new conditions augment the burdens of the community.

An additional problem is the incidence of delinquency and crime among the high-grade defectives. In some cases this is due to psychopathic tendencies or clearly developed antisocial trends but more often it is a result of the suggestibility of defectives which invites exploitation by more intelligent criminals, or by organized gangs of delinquents. However, the contribution of the mentally defective population to delinquency and crime is not great, since it has been estimated that not over ten per cent of delinquents are mentally defective, though a much larger percentage is "subnormal." In England a special classification "moral defective" has been established, but no comparable term is used in the United States. In a particular case the development or non-development of delinquency is apt to depend upon the degree

of protection which is afforded by the family or the community, or, lacking this, by some institution. Many unmarried girls between the ages of fifteen and twenty-five become pregnant and finally habitual delinquents because they lack adequate family support or supervision. Many boys aged fifteen to twenty become members of organized delinquent gangs for the same reason. Increasing recognition of the drain upon the economic and social resources of the community due to the high grade defective and borderline groups has led a number of states within recent years to develop community programs for dealing with the problems presented by this segment of the population. The programs vary in the extent to which they call for an integration of such community resources as educational systems, private and public agencies, and institutions. In some states emphasis has been placed upon central registration of defectives and prevention of marriage. Massachusetts and several western states maintain statewide supervisory and advisory clinical services. In other states emphasis is upon development and utilization of local agencies.

CHARACTERISTICS OF THE MENTALLY DEFECTIVE

Since various and discrete conditions are included under "mental deficiency" only limitation in intellectual ability and social competence is common to all defectives. Within the mentally defective group, psychological characteristics, incidence of pathological conditions, and physical characteristics vary with mental level and with clinical type. For all subgroups (except within the idiot level and for certain clinical entities for which a few fairly specific characteristics have been established) both the range of individual differences and the degree of overlapping with other groups, are large. Although it is generally considered that "feeble-mindedness is indicative, not only of mental malfunctioning, but also of physiological malfunctioning," attempts to establish specific relationships between physical, physiological or pathological conditions on the one hand, and psychological characteristics on the other, have had little success.

PHYSICAL FEATURES AND PATHOLOGICAL CONDITIONS

Recognition of specific physical characteristics and pathological findings has largely determined the identification of clinical types of

mental deficiency. However, even those clinical types within which there is greatest homogeneity show individual variation and in no type are all gross characteristics of the type invariably present. Furthermore, no features except certain biochemical alterations and neuropathological conditions have been demonstrated as exclusively coexistent with any specific clinical type. An alteration in metabolism resulting in excretion of phenylpyruvic acid in the urine of the patient, is the identifying characteristic of phenylpyruvic oligophrenia (or ketonuria), a clinical type first described in 1934. Accompanying this bio-chemical condition are anomalies of the motor system and pronounced mental defect. The latter, however, covers a considerable range, two-thirds of the identified cases being idiots, and one-third imbeciles. Disturbances in lipid metabolism found in gargoylism, amaurotic familial idiocy, and related types having a similar neuropathologic picture are associated with clinical manifestations that differ for the different conditions. In gargoylism there are disturbances in skeletal growth, mental defect is not always present, but if present, is apparent from birth, convulsions rarely occur, and deterioration is not characteristic. In juvenile amaurotic idiocy, on the other hand, skeletal changes have not been observed, mental development appears normal up to five or six years, convulsions are invariably present, and there is progressive deterioration, reaching profound idiocy within a decade.

Mongolian defectives, studied extensively since the condition was first described by Langdon Down in 1866, and constituting a numerically important group, present a relatively homogeneous combination of physical features. Among these are commonly found: a narrow, oblique, palpebral fissure; epicanthus; micro-brachycephalic skull; small, broad, depressed nose; small, round mouth; large, often protruding and fissured tongue; small, broad, stubby hands; widely separated big toe; extreme laxity of the joints; disturbances of dentition; and delayed puberty. Disorders of the nervous system are not conspicuous, but autopsy findings have shown defective development of the brain and pathology of the hypophysis. Brousseau, reporting on 206 cases, found approximately two-thirds to be imbeciles and one-third idiots. Mongols show unusual susceptibility to respiratory disease; congenital cardiac anomalies,

as well as other structural deviations are frequent. Cretins, constituting perhaps the earliest recognized, and one of the most widely studied clinical groups, like mongols, show greatly retarded physical development but they do not show the markedly delayed and irregular dentition that is characteristic for the mongol group and they lack many specifically mongoloid features. Other clinical types have less distinct patterns of physical and pathological characteristics, the familial mental defectives showing greatest heterogeneity of physical features and least frequent occurrence of pathological conditions.

For both physical characteristics and pathological conditions, relationships to mental level or degree of defect are less specific than relationships to clinical type, though frequency of abnormalities increases with decrease in mental level. Thus few idiots are entirely without physical or neurological defect and some present a veritable museum of abnormalities. Developmental anomalies of special sense organs and of the nervous system are frequent. Physical stigmata, lack of symmetry and of effective co-ordination are common. In both stature and weight idiots are below the non-defective population. Their life expectancy is less; the average age of idiots in New York State institutions at time of death being 19 years, and of imbeciles, 31 years. In the imbecile group incidence of defects and malformations is more variable; many approximate the non-defective population in appearance. The moron and borderline groups, excepting cases of specific clinical type, are relatively free of pathological conditions, and of physical or neurological defects.

PSYCHOLOGICAL CHARACTERISTICS

The first attempt at careful description of the psychological characteristics of the feeble-minded was made by Binet who undertook comparative studies of mental abilities of idiots and imbeciles in psychological functions ranging from rudimentary processes to the highly complex activities involved in abstraction, judgment, reasoning, and language. Binet demonstrated that such a hierarchy corresponds roughly to levels of mental ability, the entire range of abilities being present in the non-defective individual, whereas in individuals of the mentally defective group the more complex processes are limited, and may be absent if the defect is severe. In a

defective individual, limitation in function throughout the hierarchy of psychological processes is roughly related to the degree of defect. The psychological behavior of an imbecile, therefore, is less like that of an average individual than is the psychological behavior of a moron. At all levels of mental defect the more complex processes are most severely limited, the more rudimentary (as, for example, simpler forms of perception and sensory-motor behavior), are less limited. Thus two defectives, one of moron and one of idiot level, will differ far less in ability to avoid collision with a chair, than in ability to describe a picture. Within this general scheme there are wide individual differences, with examples, at every mental level, of defectives whose abilities are relatively even, and of others whose performance in one or several areas of mental activity may be far inferior or far superior to their general capacity. The idiots savants, having unusual memory or musical skill or facility with number combinations (sometimes far in advance of the ability of the average individual) together with severe mental deficiency in all other areas, present extreme examples of the possible unevenness in mental abilities which may be found within a population of mental defectives.

The idiot is least representative of the human species. Though most severely limited in range of behavior this group is far from homogeneous, except in regard to the absence of the more complex mental processes. Motility patterns range from a generalized hyperactivity to extreme limitation of movement. Stereotyped activities such as rocking, peculiar sucking, clucking noises, or picking at parts of the body, are common, and are similar to those observable in deteriorated psychotic patients or in caged chimpanzees. Postural control is of variable adequacy but good coordination is infrequent. A number of idiots learn to walk, but their gait is clumsy. Many learn to sit and others crawl or hitch themselves about. Some establish sphincter control. Vocalization differs; many are noisy but unintelligible. A limited number learn to pronounce one or two words fairly intelligibly. Because of technical difficulties little reliable data regarding the sensory acuity of idiots is available, though observed responses to taste, olfactory, auditory, and visual stimuli give indication that unevenness in the sensory fields is common. Capacity for sustained, controlled at-

tention is lacking, and brief, spontaneous attention given to external stimuli varies greatly, not only from one individual to another but also from time to time for the same individual. There is also great variation in social interest and responsiveness, a limited number of idiots showing no sign of recognizing individuals, whereas others show decided social preferences and develop strong attachments, even exhibiting solicitude for the welfare of a particular companion or cottage mate. Physical aggressiveness, apparently unpremeditated, such as biting and striking are not uncommon within an idiot group, but these manifestations are usually limited to a small number of individuals, and are for them either habitual or recurrent. Such explosive behavior, like stereotyped activities, may appear at times of general excitement, or may occur in the absence of external stimulation, possibly as a mechanism for energy or tension release.

Imbeciles as a group show less limitation of psychological function and greater awareness of their environment than idiots. Ability to attend to personal wants, development of habits, simple speech, social discrimination, responsiveness and interest, are all present in varying degree. Speech defects are present in more than 50 per cent of all imbeciles and are not remediable. Memory for specific material may be highly developed and learning of a simple sort is present throughout the group, but capacities for generalization, abstraction, judgment, and problem solving are limited. The range of emotional behavior in some individuals seems to approximate the emotional behavior of the average non-defective individual. Sexual interest and behavior vary within the group but are less frequently noted, and less marked than among those of moron level.

The school-age "moron" differs from the child of the "borderline" or "dull-normal" categories in the over-all account he gives of his mental ability in standardized test situations, and in his lack of ability to meet the academic requirements of the upper grades of the average school system. Up to the third or fourth grade many morons make fair progress, but when presented with requirements which go beyond the mechanics of reading to the comprehension of material presented by the printed page, beyond simple enumeration to the mastery and use of numerical relationships, beyond simple, direct

communication to imaginative and symbolic dealing with the problems of the social environment, their inability becomes readily apparent. In some cases the inability appears as a general retardation in all areas of mental functioning, in others, as a marked inadequacy in some particular area, such as verbal comprehension or social judgment. Speech defects are more frequent than among non-defectives, and at the moron level remedial procedures are effective. Detection of adult morons is more difficult than in the school-age group since casual observation is insufficient, and such individuals are seldom placed in standardized situations.

PSYCHOLOGICAL RESEARCH

Many of the psychological studies in the field of mental deficiency have been directed toward immediate clinical needs rather than toward basic psychological problems. Of the three pioneers in the field, Itard and Binet (especially the latter) were concerned more with theoretical considerations than with practical applications. Early studies in the United States, however, were influenced by Seguin, whose interest was almost exclusively in the clinical aspects of his work. Although the tests of Binet and Simon were quickly adopted in America, little attention was given to the psychological studies which preceded and accompanied the test development. Early work in this country was thus directed toward practical questions relating to the value of tests, whether for determining potential academic achievement, for selection of those who required institutional care, or for classification of institution populations. Many studies were concerned with determination of the validity and reliability of the measures. This preoccupation with test application obscured for many years more fundamental questions as to the nature of intelligence and of mental defect, which Binet had originally set out to investigate.

Recognition of limitations of the Binet Scale, especially its dependence upon verbal and symbolic material, led to development of additional measures: the Porteus Maze test, the Kohs Block Design test, various other performance tests and scales (Healy, Pintner-Paterson, Arthur Point, Kent-Shakow) and the Vineland Social Maturity Scale. These were designed to provide either supplementary, or more accurate, clinical or diagnostic instruments. The field of mental

deficiency became a proving ground, not only for successive translations and revisions of the original Binet-Simon Scale, but for other measures, many of which were standardized, in part, by establishing correlations with Binet test results. The multiplication of tests led to questions regarding selection of tests and interpretation of divergent test scores, to more intensive study of individual cases, and to increasingly controlled investigation of the clinical significance of specific patterns of test performance.

As the number of tested mental defectives increased, other clinical problems claimed attention. Studies were made of concrete performance abilities, of "social competence" as distinguished from "mental level," of the effect of highly specialized programs, and of the later community adjustment of those trained in special classes or released from institutions. Current information and practice in the training and counselling of the higher grade defective population have depended largely upon these clinical studies.

No clear line of demarcation can be drawn in this field between clinical studies and non-clinical research. In the development of the Binet Scale the need for a clinical instrument was closely related to interest in the psychological problem of intelligence. Goddard's investigations of the psychological functioning of the subnormal, like Binet's studies, extended beyond specific clinical aspects of mental deficiency. Kuhlmann's annual re-examination of 639 defective subjects over a ten-year period, contributed to general psychology as well as to the clinical field. His data show that the rate of mental development depends upon the grade or level of intelligence, that the rate decreases with age for all grades, that for all groups the mental age ceases to increase between fifteen and eighteen years and that the mental growth curve of the idiot ceases about three years earlier than for those of borderline intelligence. More recent studies of groups carefully selected on the basis of clinical type or of etiology have shown that Kuhlmann's statistical findings, though accurate as to general trend, are not invariably valid for prediction of development for an individual defective, since clinical type, etiological condition, and environmental circumstances all influence the curve of individual development. Exogenous cases, for instance, often show a drop in mental age. Results of other early studies are no longer taken at face value

and their theoretical implications are being questioned.

During the past decade psychological research in mental deficiency has partly broken away from its preoccupation with investigation of "intelligence." The range and variety of both problems and methods have been greatly extended. Experimental procedures from the fields of child and animal behavior and from physiology have been used in exploratory studies. The objectives of investigations have been more clearly defined and the experimental subjects more carefully selected. These recent studies are too numerous, too diverse, and too largely preliminary in character to justify detailed report or to warrant attempt at the present time to evaluate their ultimate contribution. A few have been selected for mention as illustrative either of recent trends in investigation or of careful attention to experimental controls.

Werner and Strauss, in a series of studies using various tests and experimental methods, have compared the psychological performance of "brain-crippled" subjects (having "a brain lesion acquired by trauma or inflammatory process, before, during, or after birth") with the performance of subjects of the same mental level from the endogenous (familial) group. In contrast to the latter, they find that subjects of the exogenous group show disturbances of organization in sensory-motor, perceptual and thought processes, with tendencies to pathological perseveration, more frequent "incoherent" responses, greater distractibility, and a higher frequency of "animistic" responses suggesting "a pathologically altered relation to the outside world." In addition to their clinical significance these studies approach theoretical problems of mental organization.

A number of comparative studies have been reported. Rethlingshafer used interrupted tasks with various conditions of interruptions in a comparative study of college students, normal school children and mentally defective subjects and found little difference in tendency to resume activities though barriers to resumption had greater effect upon defective than upon normal subjects. Gardner has studied the learning of low-grade aments (idiots and imbeciles), using experimental conditions previously used with various domestic animals (horses, cows, and sheep), and found a quite similar rate of decrease of errors, though the aments were less

stereotyped in their errors than animals. Studies of the relative influence of mental level and life experience in determining generalizing ability, concept formation, vocabulary and development of thought processes, based on comparison of groups of mentally defective subjects at given mental ages with selected differences in chronological age have shown the importance of mental age in the development of complex mental functions.

A few exploratory investigations have been concerned with problems of "personality differences" in mental defectives. Porteus, in discussing the maze test emphasized its value in affording opportunity to detect "the impulsive and headstrong with little tendency to preconsideration, the nervous and excitable, the irresolute and easily confused, the impractical, dreamy and dependent, the over-confident and over-inhibited, or children too self-determined to heed or follow instructions accurately." But, though recognized clinically as characteristics frequent among defectives, until recently there has been little research attention to these differences. A few studies have investigated tendencies to perseveration, response to frustration, and behavior in situations requiring social participation. Abel has devised methods for study of inter-personal relationships and dominant behavior of institutionalized defectives. A study of major emotions in mentally defective subjects was made by Morrison who concluded that emotional development is a complex process not definitely linked with physical or physiological maturity. The Rorschach procedure has been more widely used. In addition to confirming other data regarding the stereotypy of the mentally defective individual and his inability to generalize and to integrate elements of experience, the Rorschach results have indicated strong reaction to color, wide variation among defectives in emotional control, and in patterns of perceptual behavior. These differences in Rorschach performance are considered indicative of differences in personality organization. Many areas remain relatively unexplored. Doll has listed some of these, including motor development, maturation, learning, and motivation. Speech and language and their use by defectives of different levels has had little attention.

There is as yet in the field of mental deficiency no comprehensive psychological research program comparable to those in other fields of

psychology, as, for example, in the studies of animal behavior. Thus there has been no controlled, systematic investigation of specific psychological problems comparable to the studies of perception in animal or normal human subjects, nor can there be found any series of studies devoted to the development of specific methods comparable to the time-sampling studies of young children. This may be accounted for in part by the conditions under which psychologists in this field have had to work, in part by the sporadic and sometimes incidental nature of their interest, and in part by the generally limited appreciation of the research material which the field affords.

Emphasis continues to be focussed upon clinical problems. Largely as a result of the long-continued efforts by Doll, Goddard, Hegge, Porteus, and others, there is increasing interest in clinical research and steady improvement in the quality of clinical studies. Clinical facilities for mental defectives have been improved in many states. Recognition of the challenge offered by the somewhat simplified mental organization of the defective subject is indicated by current suggestions of the need for basic research. It would be possible today to take exception to the statement made by Binet that those working with the mentally deficient "have never examined them from the point of view of questions which their mental state raises in regard to modern psychology," nevertheless, in many respects, the statement is nearly as true as in 1908 when it was written.

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FETAL LIFE, BEHAVIOR DURING.

—Anyone who is interested in what adult human beings do or can do is almost certainly also interested in the antecedent steps by means of which such behavior has developed. The study of fetal behavior is a study of the first part of this long and important growth sequence. The investigation of fetal behavior involves a consideration of all aspects of the development of the activity of the young organism from the time of conception until birth.

Until fairly recently the standard writers on child psychology thought of this field of knowledge as beginning at birth. Now it is recognized that one who would understand the background of man's early behavior must consider human responses made during prenatal life.

After fertilization the morphological development of the young organism begins. The first period of this continuous growth process is ordinarily spoken of as germinal. It typically lasts for two weeks. The next period is thought of as embryonic; this stage ordinarily is considered in man to last until about the sixth week. The final stage preliminary to birth is described as fetal and involves the period from the sixth week to birth. In every consideration of the growing human individual before birth it is important to remember that the student must at all times deal with a living organism which is maintaining itself in its environment. At every moment from fertilization to birth the new growing and living individual reacts as it does to its environment because of its own intrinsic make-up and because of the world of substances and energies in which it is existing.

As one traces back many characteristics of behavior as seen in the adult human individual, it is often very instructive to see what the characteristics in question were preceded by. When this long-section view of development is taken, it is found that, while there are certain dramatic and sudden emergence phenomena in behavior, in general it is possible to see exactly what the antecedents of each step have been. A recogni-

tion of the continuum of development is important for anyone who would understand fully the later capacities and characteristics of the organism.

The study of mammalian fetuses has clearly shown that the first gross movement of any organized cell mass or primitive organ system is the rhythmic beating of the heart. This rhythmic contraction of primitive heart cells, which may be thought of as antecedent to true heart action, begins in the human organism during the third week. In other words, this first activity of the specialized cell groups begins at about the same time set as marking the termination of the germinal period in the human fetus. In most work on the development of behavior the beating of the primitive heart cells is not considered to mark the onset of what is called true behavioral life. This distinction is made because it is recognized that these cells are beating as a result of their own metabolic processes, which are maintained in an environment made up of the fluids and cells of the organism in which the heart cells exist. Before true overt responses of the organism occur which result from muscle contractions which are under nervous control, it is possible to stimulate the muscles directly by external means. This is so-called independent effector action, the word "effector" here being used to describe motor organs of which muscles are typical. An example of such direct muscle stimulation is the response of a fetal arm or leg brought about by the direct electrical stimulation of the member. The first activity of the organism's own neuromuscular mechanism almost certainly does not occur until approximately six weeks after fertilization. Probably not until the age of eight weeks does response to external stimulation which involves sense organs and the central and peripheral nervous system become possible. This first effective stimulation results from the activating of the sensory endings of the skin.

In general it is safe to say, therefore, that at about the second month after fertilization the developing human organism first begins to be capable of responding to changes in the environment in which it is growing. In a fetus estimated at between eight and nine weeks of age strong "protective movements," as they may be called, have been noted. Such movements of both legs and the opening of the mouth have been observed following strong stimulation.

Fetuses at this initial period of response to external stimulation show slow asymmetrical and relatively noncoordinated movements.

Much has been written upon the question as to whether or not the first reactions of the growing human fetus are precise and reflex-like or whether they should be described as involving the generalized mass-action of many muscles. In the study of a good many different forms of infrahuman mammalian fetuses, as well as the observations made upon operatively removed human fetuses where pregnancy was interrupted in order to protect the life of the mother, it is clear that either description may sometimes be given with some apparent observational justification. In the young guinea pig fetus, for example, the first response to external stimulation is almost certainly a slight bending of the head and a correlated slight twitch of one forelimb. This fact has been established by the present writer and his associates after the study of many different fetal litters at just this zero point in the behavioral sequence. Certainly this response may be described as reflex activity. On the other hand, it is not possible to assert that this movement is unrelated to the general bodily posture of the entire organism. Thus those who like to say that all specific behavior is generalized from previously more diffuse behavior may be able to interpret these observations to fit that formula.

In this connection it has become recognized that the study of the growth of effective and adaptive action in certain of the lower vertebrates such as the free-swimming salamander *Amblystoma* has much to contribute to a general understanding of the first stages of growth in the human individual. The late George E. Coghill made detailed studies of the development of behavior in this type in relation to the growth of its nervous system. These studies have probably never been matched in completeness or in the clarity with which they have been interpreted. Coghill's analysis of the onset and development of the swimming reaction of the salamander, for example, involves a consideration of the following five stages: (1) a normally nonmotile state in which, however, direct muscle stimulation is possible; there seems to be good evidence that this stage is paralleled in the human fetus as noted above; (2) what may be called an early C-flexion stage, in which a light touch on the skin of any portion of the

body leads to a bending of the entire body to form a C or a reversed C; (3) a tight-coil stage in which this C reaction to either the right or left becomes more pronounced; (4) the so-called S reaction, which is characterized by a reversal of flexure before the previous flexure has been completed by the tail end of the organism thus transforming the C or reversed C reaction into an S or reversed S reaction; this S stage can thus be seen as leading to a sinuous slow swimming behavior of the total organism; (5) the speeding up of the S reaction so as to produce the typical rapid and effective swimming movement of the amphibian larva by means of which it darts through the water. Coghill has described the neural development which parallels this growth of behavior.

In the human fetus at the time the first response to external stimulation begins, the limbs have already developed. This is not true in the salamander, which swims with its body before it has functional limbs. Nevertheless there is probably more than a mere analogy between the rhythmic pattern of behavior involving the forelimbs and hindlimbs, that is, the arms and legs of the human fetus, and the primitive S reaction of the salamander.

Davenport Hooker, one of the ablest students of the development of the human fetus, says that in a fetus nine and a half weeks of age the portion of the skin which has become sensitive enough to elicit reflexes is restricted to the region about the nose and mouth. The responses that can be called out by stimulation of this area at this age include rotation of the rump and flexion of the body, as well as movement of the neck.

It is at about this period, between nine and twelve weeks, that so-called spontaneous behavior of the human fetus is first noted. This is an especially important observation. Anyone who is interested in the later activity of the living human individual must necessarily be concerned with this first beginning of activity which seems to well up from within the organism. Such behavior seems at first sight to be qualitatively different from behavior resulting from external stimulation. It is indeed this capacity for apparently spontaneous activity which has led in the adult human being to almost all of those characteristics which we think of as basic to the freedom of man. Some writers have even spoken of such behavior as not caused but

as a cause. The first spontaneous activity of the fetus, however, must not be considered as uncaused. Certainly we have no reason to think that it results from some new nonbiological force related to what nonscientific writers call "will power." Rather, such reaction may be seen as a natural working out of the growth process of the organ systems of the fetus itself. H. C. Tracy, in a careful study of the development of behavior in fish soon after hatching from their eggs, points out that these little larvae normally lie quiescent at the bottom of a containing vessel. Then suddenly they move. On the basis of a study of this spontaneous behavior this investigator comes to the conclusion that the onset of these reactions follows the cumulative development in the blood stream of the organism of what are called metabolites or the products of the life processes of the cells of the organism. As these products of cell activity build up, the oxygen available to the tissues gradually decreases. This leads to a slow and complex change in the chemistry of the blood. According to Tracy this change is cumulative, and when the metabolites build up to a special point, sensitive centers of the central nervous system are stimulated and neural activity leading to behavior results. The result of this stimulation of the central system is a neural discharge to muscle groups which brings about a reaction of the body-moving muscles of the organism. Incidentally such responses change the relationship of the organism to its aquatic environment and again place it in contact with water in such a manner as to provide more oxygen. Tracy, on the basis of these studies, makes some suggestions which may apply at least by analogy to the early form of spontaneous behavior in the human organism. He holds that if external conditions could be kept constant, the activities of any organism would be determined by the cyclic changes in its own inner life processes, that is, of its own body metabolism. This would mean that the behavior of the total organism might well be rhythmic in its external environment as the beating of the primitive heart-cell system inside the organism is rhythmic in its organismal environment. This would mean that the total organism might be considered, as it were, to beat or react in a timed sequence to its external environment as a result of its own internal activity.

The observations just given point to an im-

portant fact. From the very early period in the growth of behavior the organism is activated not only from without but also from within. As a result of internally initiated movements the organism changes its orientation, and thus the pattern of external stimulation is changed for the organism even though there has been no stimulating alteration in the external energy field itself. Thus the external senses are newly stimulated, and continued adaptive behavior resulting from both internal and external stimulation goes on.

By the age of fourteen weeks the behavior of the growing fetus has become such that almost all of the body parts may participate in adaptive behavior acts. Sometimes response is so general that it seems to involve nearly all of the muscle groups in a sequence of responses. It is at this period for the first time that we find observers describing behavior as "graceful" and "delicate." In the period between thirteen and sixteen weeks of age the effectiveness of the responses of the growing fetus to accomplish "results" by reacting to its environment continues to develop. At this time every part of the skin can be stimulated in such a way as to release typical and often apparently adaptive reflex behavior. Neurologists who are interested in the control of behavior at various central nervous system levels are interested in such behavior. It is pointed out, for example, that stimulation of the sole of the foot can be shown at first to lead to independent action of the muscles under the skin that is stimulated. Next, true neural action comes to take over the control of these muscles. At first the connection is in the spinal cord. Still later, subtle changes can be noted in the reactions of the toe and foot as progressively the centers of the brain located in the medulla, the thalamus, and finally the cortex are involved in mediating such responses.

From seventeen weeks to normal birth time almost all of the reactions which are noted in the human baby in the first days after birth gradually appear. In the latter part of this period operatively removed *premature* fetuses show many responses which are characteristic of the newborn child.

One of the best avenues for the study of the characteristics of human behavior previous to birth is the study of the sensory capacity of the fetus. As noted above, the first sensory field to become effective is that of the skin. The skin

is made up of a mosaic of sense organs or receptors which include those specified for mediating stimulation by soft and deep pressure, temperature and pain, and, it may be, other modalities. It is interesting to note that the fetus in acquiring cutaneous sensitivity develops before birth the ability to localize the point stimulated by moving a limb to the point touched.

The author of the present article was at one time so convinced of the truth of what has been called the learned character of an organism's ability to localize stimulation upon its bodily skin surface that he doubted facts to the contrary. When he read in the writings of Wilhelm Preyer, one of the earliest and greatest investigators of fetal life, that a guinea pig fetus before birth could localize with its paw the point touched, he felt that there must have been a mistake in the observation. Later, however, the writer's own experimental investigations confirmed in all respects this previous observation of Preyer, and showed that the idea of the learned character of such responses is almost certainly in error. The ability of an organism to localize the point stimulated develops as a result of the internal inherited or genetically determined growth of the nervous system. In certain instances it can be demonstrated that the localizing responses are made without any opportunity for previous exercise of the function. It is also interesting to note that weak or strong cutaneous stimuli have quite different effects when applied to the skin surface of developing fetal organisms. In general a weak stimulus elicits much less general activity than does a strong stimulus. In a good many instances a weak stimulus applied, for example, to the pads of the paws of a mammalian fetus may lead the fetus to move *toward* the stimulus. It reacts to such soft stimulation as if to secure more of it. A strong pressure stimulus, on the contrary, when applied at the same point may cause the organism to withdraw the member touched and then, by the use of more general muscle groups, the whole organism sometimes moves away from the point stimulated. Experiments conducted by the writer have shown the effect of strong and weak cutaneous pressure stimulation in quantified terms. Similarly it has been demonstrated that cutaneous temperature receptors may be stimulated by stimuli cooler or warmer than the physiological zero of the organism. In general the further

from this physiological zero, that is, the "stronger" the temperature, the more apt such stimuli are to call out responses.

A good many very specific cutaneous reflexes may be observed in fetal mammals and in the human fetus. The writer's own work on the development of so-called *reflexogenous zones* in the fetal guinea pig has convinced him that in a quiescent fetus in a normal posture there is typically one behavior act or reflex and only one such act that is set off by the optimal stimulation of each cutaneous area. These cutaneous "push buttons," as they may be called, are thus seen to be remarkably specific in their behavioral relation when the complexity of the central nervous system is considered.

The philosopher John Locke interestingly enough spoke of the pain sense of the fetus. Since the time of this early note there has been little direct experimentation upon the pain sense in mammals before birth. A number of casual observations show, however, that the application of stimuli must have caused gross destruction of the skin and subcutaneous protoplasm and not called out very pronounced movements on the part of the fetus. The present writer's experimental work tends to confirm the fact that an increase in pressure over that necessary to bring out typical responses to deep pressure receptors does not always seem, at least in infrahuman fetal mammals, to increase the extent or intensity of response. In many instances the light pressure of a fine hair may lead to extension, and stronger pressure, as noted above, to retraction. But very strong, "painful," or even obviously destructive stimulation, applied to the same point by needle or heated wire, may not make any observable difference in the elicited response over that noted to strong pressure stimulation. It has been suggested that the necessary pressures and strains of mammalian birth would cause a very severe shock to the central nervous system if the pain mechanism were highly developed during the period before birth.

There can be no doubt that the proprioceptive senses, including neuromuscular spindles, are found in a well-developed form as early as the fourth month of fetal life in the human individual. No one who has observed mammalian or human fetal behavior can doubt that, in the later period at any rate, many of the responses noted are reactions following muscle receptor

stimulation which has itself been initiated as a result of previous activity. Extremely well correlated and apparently purposeful movement can be observed in late fetal life which almost certainly involves stimulation which originates in the stimulation of receptors in the muscles and in other related proprioceptive receptors.

Many students of behavior agree that *locomotion*, as seen, for example, in the crawling movements of the fetal opossum, *sucking* in order to bring in nutriment, and *air breathing* are three of the earliest essential behavior systems of the newborn mammal. It is interesting to note that each of these responses in its developed form depends to a certain extent upon proprioceptive stimulation.

The so-called static receptors in the nonauditory labyrinth of the internal ear are probably to some extent functional before birth. It is, however, very difficult to isolate behavior released by these static receptors as *contrasted* with behavior released by the stimulation of muscle and other so-called proprioceptive sensory systems. Those who have studied the early responses of fetal mammals have been able to elicit some of the very special patterns of limb extension as a result of turning the animal's neck to the right or to the left. Minkowski, one of the most thorough students of human fetal behavior, believes that most of the fetal responses related to the nonauditory labyrinth may be thought of as the result of effective stimulation of receptors in the semicircular canals. It is well known that stimulation of the nonauditory labyrinth by rotation and in other ways brings about compensatory movement of the muscular system of the organism and especially directs the movements of the eyes. Zing Yang Kuo, a distinguished Chinese student of early fetal behavior, has demonstrated the fact very clearly that the nonauditory labyrinthine control of eye movements is, at least in certain infrahuman animals, developed long before the control of eye movements may be brought about by retinal stimulation with light.

Historically, there has been some discussion of the organic senses as they begin to be functional in the fetus. The philosopher Locke, who has already been quoted as making an observation on the pain-sense in the fetus, holds that in the early period of fetal life the unborn child has perhaps, as he puts it, "some faint ideas of

hunger and thirst." Certainly at the present time very little can be said that is definite concerning the part played in fetal behavior by stimulation which may originate in the organic senses, or, as they have been called, the interoceptors, which are related to the internal digestive and other organ systems of the body. At a previous point in this discussion some reference has been made to a theory of *drives* or *motivations* which holds that the activity of the organism may be conditioned in part by alterations in the internal environment of the individual. It should be noted however that, at least in certain instances, another form of internal stimulation besides that already discussed, namely, stimulation resulting from the activation of receptor organs inside the organism and related to hunger, thirst, satiation, and the like, may be considered. It seems altogether likely, for example, that in a state of hunger the internal stimulation which is affecting the organism may at times be related both to the chemical change in the blood acting directly upon certain centers in the nervous system and also upon stimulation of receptors internal to the organism resulting from alterations in the rhythmic hunger contractions of the stomach which appear sometimes when no food is present in the stomach.

There has been a good deal of discussion in the earlier literature of fetal sensory processes as to whether or not the unborn organism could taste the liquid of the environment in which it existed. The study of the nature of receptor stimulation leads us to believe that all stimulation depends upon environmental change and upon change which occurs rapidly enough to bring about a shift in the receptor mechanism such that a wave of negative depolarization (i.e., stimulation) may be initiated in the receptor cells and associated neural mechanism. Certainly there seems to be very little evidence that any such rapid or violent change in the characteristics of the amniotic fluid can occur during fetal life so that the taste buds would be stimulated. What has been said about taste also applies to olfaction. The olfactory receptors could be stimulated by liquids even if not by prenatal airborne stimuli provided rapid enough changes in the amniotic fluid might be detected. Since no such changes have been observed, there is little reason to suppose that smell is an effective sense before birth. In all work upon smell in

newborn animals great care must be taken to isolate the stimuli used so that they will not affect what neurologists call the "trigeminal components" or the receptors related to the "common chemical sense" as described by G. H. Parker. If ammonia, for example, is used as a smell stimulus, there is very little doubt that instead of stimulating the olfactory receptors exclusively, the pain receptors of the common chemical sense will almost certainly also be brought into action. Experiments are reported on newborn infants, or at least on 18-day old infants, in which a breast nipple on which kerosene had been placed was refused, while the other nipple, which had been treated with an odorless oil, was eagerly taken.

Kussmaul, one of the well-known students of early sensory processes, has stated that "the sense of hearing sleeps more deeply than any other sense." More recent experiments in which the present writer has participated seem to indicate that as a result of the use of electrical methods of investigation the truth of this observation may be qualified. The receptor mechanism for auditory stimuli is effective before birth, and as soon as the liquid filling the ears is removed, the late fetus can hear. This judgment is made on the basis of evidence that is both electrical and behavioral. In this connection there have been a number of interesting observations and experimental studies of the responses made by normal human fetuses to loud auditory stimuli sounded outside the abdominal wall of the mother.

From the general psychological point of view there can be no doubt that vision is the most important human sense. It is certain that in normal prenatal life there is little likelihood that any effective light stimulation acts upon the retina of the fetus. There is evidence, however, that pronounced differences between light and dark bring about specific reactions in infants born as much as two months before the normal term. At the time of normal birth the optic nerve and related structures have not yet fully developed anatomically. This suggests that the visual mechanism can function long before it is anatomically fully developed. One of the early responses to develop to strong light stimulation is the contraction of the pupil. There is a great difference in the relative level of development at the time of birth of the eyes of different mammals. The guinea pig, for example, is born

with eyes open and apparently in an almost adult state. In the cat the eyes are closed far from functionally effective at birth.

In the long summary of the development of the senses that has just been presented, the nature of the stimulus control of behavior in the prenatal period has been explained. Something of the character of what has been called sensory experience in the unborn infant has also been suggested. Speculation on early introspectively known sensory experience is probably rather profitless. There does seem to be some evidence which suggests that growth during active fetal life and infancy is paralleled by a development of sensory experience in which more and more specific sensory patterns come to be differentiated out of a general matrix. Indirect evidence favors this view rather than the older notion that sensory experience at any given moment is a summation of previously more simple and "pure" experiences. As Coghill has well pointed out, both the development of behavior and the hypothetical development of sensory experience seem to follow an old evolutionary rule. Growth in most cases involves the gradual development of the specific and the particular from previously more general and homogeneous antecedents.

As has been suggested previously, it is dangerous to take such a simple formula as a complete statement of the way in which fetal behavior or experience does develop. It has been noted above that the cutaneous receptors of the organism may at very early stages be thought of as push-buttons which initiate specific patterns of response or reflexes. In certain instances it is possible to show that these very specific responses begin as soon as any response can be elicited by stimulating the particular receptor area or reflexogenous zone in question.

In fact it is too much to hope that a general and simple formula concerning fetal development can be provided. It seems, as is so often the case in science, that the careful student of the development of fetal behavior must turn back time and time again to direct observation and to the study of growth of functions of specific receptor and motor systems in order to explain how behavior develops. It is clear that an increasingly exact knowledge of the myelination time of various levels of the peripheral and central nervous system and of the growth of specific neural pathways and connect-

ing mechanisms will add greatly to the understanding of the time of the onset of specific responses in the organism. As pointed out above, Coghill has carried out work of this sort in a way that will always remain a model for students in his study of the correlation of behavior and neural structure in the developing salamander. Windle and his associates have made many similar studies of birds and mammals. Davenport Hooker and his coworkers have similarly made a most propitious beginning in the analysis of the neural basis of certain specific forms of human fetal behavior. In spite of studies of this sort the scientific literature still contains some dogmatic and only partially demonstrated statements concerning the anatomical basis of, for example, the first movement made by fetal mammals. There are theories of the maturation of the nervous system which involve the reorganization of neural elements at synaptic junctions; there are theories which assert that first responses depend upon myelination of the nervous system; and there are chemical and physical theories which have been developed to account for the functional growth of the nervous system in relation to behavior. It seems increasingly clear, however, that the final answer in regard to the basis of any behavioral act will almost always have to wait for most careful, detailed, and specific functional and morphological analysis.

A good many questions of a more general psychological sort are at times asked about the mental life of the fetus. For example, the question occurs in the literature: Does the unborn child have intelligence? It is clear that the answer given to this question will depend upon the way in which one defines intelligence. If intelligence is defined as "dependent upon past learning of the organism," it may with some assurance be said that the fetus probably does not show intelligence. If on the other hand intelligence is defined so as to include adaptive responses which may result from inborn reflex or other neural mechanisms, then obviously the fetus does show intelligence.

In the last few sentences the problem of learning in the fetus has been referred to. There has been a good deal of discussion concerning the possibility of learning before birth. Certain recent experiments have been carried out on pregnant women in an effort to show that conditioning may be brought about in the fetus

before birth. As yet this field has not sufficiently advanced to allow sure conclusions to be drawn. In general it may be said that before birth the behavior shown by the organism is a function of the inherited make-up of that organism as brought out by the internal and external environment then acting upon the fetus. In making this statement the writer is not unaware that without a constant environment the mechanisms of heredity could not have made possible the development of the nervous system or the functional behavior systems of the fetus. Experimental study seems to indicate that not until after birth and then only very slowly is it possible to bring about conditioned responses or other learned reactions in the newborn organism. The fact that the fetal animal cannot be "conditioned" requires the psychologist who is interested in the mental life of the fetus to deal almost exclusively with inborn reflexes as a measure of the sensory or other processes which he is investigating.

From the standpoint of educational psychology, therefore, it can be said that all the psychological reactions described in this chapter have been concerned with the development of the sensory neuro-muscular mechanisms which are antecedent to those reactions which result from learning. It should be remembered, however, that learning involves the modification of already functionally effective behavior, and that such modification can take place only in a brain which has developed to the stage in which neural learning is possible. The matrix of behavior with which the educational psychologist begins when he first speaks about learning or any type of environmentally determined modification of response is the inborn behavior capacities of that very wonderful creature, the human fetus.

It has long been recognized that to begin the study of anatomy without an understanding of embryology, that is, to attempt to describe the adult form of living organ systems without understanding how these structures developed, would be unthinkable. It may be a slight exaggeration to suggest that a similar relationship exists in psychology, but the present writer hopes that the discussion presented above will show the reader that fetal life is important in any complete understanding of mental life. The reactions of the living organism before birth are significant for one who wishes to understand

as completely as possible the real basis of the adult mind of man.

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FRAMES OF REFERENCE IN PSYCHOLOGY.—A frame of reference is either a limited universe of discourse or a world view which takes a limited universe of discourse for its starting point, and represents an extension of that limited universe. The statement of a psychological world view is a metapsychology, and only a minority of psychologists have formulated frames of reference in that sense of the term. That minority includes, however, great names like that of William James and Sigmund Freud. On the other hand all psychologists have a frame of reference in the narrower sense of the term. All scientific research presupposes some limited universe of discourse. In other words all research is based upon the assumption that some things are highly relevant to the solution of a particular type of problem, while other things are less relevant and still others may be totally irrelevant. Any frame of reference in psychology is based on beliefs concerning what data are relevant to psychology, concerning what observational methods are useful, and concerning what scientific constructs are permissible.

Contemporary psychologists agree almost unanimously that the aim of psychological science is to increase man's ability to understand, predict, and direct the behavior of living organisms. There is considerable controversy, though, about how broadly the term "behavior" should be defined. Psychology uses, in the quest to fulfill its aim, three most general types of data. All psychological frames of reference admit the importance of data pertaining directly to the organisms which are being studied. All accept the value of collecting data about the stimulus environments of those organisms. Some psychological frames of reference admit the relevance of data which pertain to the objective products of behavior by the organisms. Only today is a start being made toward adequate exploitation of that third type of data. The use of cultural artifacts of many kinds as data for interpreting behavior promises to have results which will greatly reorient prevailing frames of reference.

Experimental behaviorists observe interactions between organism and environment with the purpose of isolating stimuli which can be char-

acterized in terms of strictly physical measurements. Such psychologists use the following classes of stimuli as data for explaining behavior: mechanical stimuli, electrical stimuli, chemical stimuli and photic stimuli. On the other hand the frame of reference which is commonly accepted in social psychology and clinical psychology does not stress the physical aspects of environmental data. To a social or clinical psychologist the fact that a neurotic child's father is a "snobbish" person might be acceptable as a basic datum for interpreting the child's behavior. Some psychologists concentrate upon those data which are described in a physicalistic language in terms of such variables as length, breadth, thickness, duration, energy, etc. Other psychologists concentrate rather upon environmental data which must be characterized in sociological language in terms of such variables as friendliness, defensiveness, aggressiveness, subjective time, etc. This difference in frames of reference arises from divergent purposes for engaging in psychological research. The clinician's aims, for example, are eminently practical while those of the student of rodent behavior are as completely divorced from the socially pragmatic as any aim could be.

Gestalt psychologists have made considerable use of physical stimuli as data in the study of perception. Members of the Gestalt school have stressed greatly the importance of achieving knowledge about the formal characteristics of groups of physical stimuli. The way particular stimuli are arranged in space and time is always an important datum within the Gestalt frame of reference. To a certain extent other contemporary psychologists, including even those behaviorists who impugn the value of studying experience as such, have accepted the general Gestalt principle. Many experiments have tended to prove that differences in formal relationships among stimuli are decisive factors in the causation of response differentials.

Certain parapsychologists assert that there are purely mental (non-physical) stimuli. Other parapsychologists believe that hypothecated acts of extra-sensory perception must be stimulated physically. Some believe that one brain may affect another through radiations or waves, having as yet undetermined physical properties. Since it is very doubtful that extra-sensory stimuli, whether mental or physical, have been scientifically observed, they probably should not

be said to constitute one class of psychological data. Rather, they are constructs which are hypothecated to explain certain avowedly extra-chance results in experiments in which subjects are asked correctly to name certain stimulus-objects which they supposedly cannot perceive by sensory means. In later paragraphs the topic of psychological constructs will be discussed on its own merits.

Next the bearing of different frames of reference upon the problem of data pertaining directly to organisms should be considered. Most psychologists use the following classes of such data: introspective data, behavioral data (changing relationships between the organism and its environment insofar as these are brought about by the organism's own movements), anatomical data and physiological data. Some include physiognomic data as a distinct type but this group might be classed under the anatomical category.

Extreme behaviorists have ruled out introspective data as a distinct type. It has been said that, since private experience is socially revealed through verbal behavior, the verbal behavior itself is the true terminus of observation. It should be noted in considering the merits of this contention that all observation of data involves mediating factors. When a camera is used in the study of behavior which is too rapid to be adequately observed by direct vision, for example, the observation of the behavior is mediated by mechanical factors whose possibly distorting influence must be duly considered. All measuring devices may have imperfections or might be mistakenly applied. And even perceptual agreement is relative to certain media of perception. Therefore the fact that introspective data are revealed indirectly is hardly unique in principle. Critical problems arise in connection with all observation. It should also be noted in evaluating frames of reference concerning introspective data that verbal expressions may have either an objective reference or a subjective reference. Eidetic imagery has been verbally described and, in some cases, eidetic memory has been found to be much more accurate than other kinds in certain quantifiable respects. For example, Gordon W. Allport found in his study of eidetic memory that British school children, after having seen a picture for half a minute, could turn away from it and project their images of the picture on a screen. Some could spell, forwards or backwards, the German word

"Gartenwirtschaft" which had appeared over the door of a building in the picture. This reading backwards was more rapid and accurate than any reverse repetition of similar letter combinations observed for half a minute and recited on a non-cidetic basis. This illustrates the fact that the subjective sphere is operationally meaningful. It is no more and no less meaningful than the physical sphere. Data of all types become socially significant through symbols but the behaviorists do not assert that symbols are the only legitimate data for psychology. Whether a fact is subjective or physical, it becomes scientific evidence only when it is described in a protocol statement wherein an observer reports his experience of it.

Some psychological frames of reference require the use of data which reveal the objective products of behavior. Psychological anthropologists use cultural artifacts as data. Personal document analysis investigates personality on this basis. The psychology of art is so based. Some animal psychologists study the nests which birds have constructed, the dens which animals have dug, the weaving of webs by spiders, and other productive data. The quantity of defecation and urination is sometimes used as an index of emotionality in the rat. To illustrate further, if two men engage in physical combat and one man is wounded, the kind of wound, its extent and its bodily location are data which reveal something about the personality of the man who inflicted the wound. Handwriting is a productive datum. Machines are data. The relative neglect of this manifold realm of observable facts related to behavior is methodologically most unfortunate, and is now being corrected by forward looking psychologists. Approaches to a science of behavior which are based on much observation of stimuli and little observation of products are approaches which bypass those characteristics of adaptive behavior which differentiate it from inanimate processes. Psychologists who stress stimuli and neglect products regress toward a frame of reference which is proper rather to mechanics than to the science of behavior. Most important of all for the scientific understanding of human behavior is the use of those products which represent and express man's attempts to interpret the world and his place in it. The products of artistic and reflective activity, products such as formal esthetic objects and informal personal documents, may be the

most valuable data without exception for the quest to understand man.

Any psychological frame of reference must legislate concerning what observational methods are legitimate. A permissible approach to this branch of the topic is to consider some conflicting frames of reference in animal psychology. The study of animal behavior is based on two chief observational methods. Systematic naturalists observe animal behavior in the natural habitat and try to discover norms for various species. Experimental psychologists study animals in laboratory situations. It has been said that field observations are of little scientific value because in the field there are so many variable factors which cannot be controlled and whose influence cannot be appraised. The naturalists have a rejoinder, however. They state that most laboratory experiments include so few variables and so rigidly restrict the animal's operations that the resulting behavior must be regarded as being rather a product of human ingenuity than of any general trends in animal behavior.

Possibly some animal experimentation is open to those charges, and many experimental psychologists would admit that field observations and laboratory work are complementary rather than mutually exclusive methods. The allegation that the higher, more complex animal activities can be studied only in the natural habitat, however, clearly is refuted by the implications of certain types of experimental work. In illustration may be mentioned John B. Wolfe's pioneering investigation of the effectiveness of token-rewards for chimpanzees. Working at the Yale Laboratories of Primate Biology, Wolfe reached some definite conclusions about the most complex, symbolic behavior which has ever been observed in infra-human organisms. In this experiment chimpanzees were trained to use variously colored tokens as means to satisfaction of various drives. The animals learned to insert the tokens in vending machines in order to get food. The effectiveness of tokens as stimuli to work (involving manipulation of weight-lifting levers) was investigated. Their effectiveness in eliciting competitive behavior in social situations was noted. The animals learned to show preference for tokens of a certain color after that class of tokens had been associated with additional rewards. Wolfe's work, the nature of which can only be suggested here, illustrates that an experimentalist's frame of refer-

ence by no means dictates that he must concentrate upon the simpler animal behavior. It is unfortunate that very few animal experimentalists have a special interest in primate behavior of complex types because animal psychology as developed to date has few points of contact with human psychology. In other words, John B. Wolfe's work is rather exceptional in that it does have a definite bearing upon the understanding of human behavior while the major part of animal psychology has implications which refer to human action so indirectly and remotely that the pragmatic value is difficult to define. For example, it is doubtful whether experiments concerning learning even by so relatively high an organism as the rat have the least value for the quest to make human education more efficient, economical and enjoyable, while it is certain that they do not have an extraordinary value in these respects. Even in regard to symbolic behavior in primates, Wolfe did not suggest that symbols were responded to as a unique class of things. Those who suppose that the rat or even lower forms like the chicken show this characteristic human trait, perhaps one of the most crucial factors in human problem solving behavior, would not be taken seriously by those who have observed the appalling differences between man and even the highest primate animals.

Frames of reference for the study of human behavior differ most profoundly concerning the scientific status of case study methods. Some psychologists say that work upon the single case may be an admirable artistic activity but that it is definitely not a scientific activity. This view is based on a certain interpretation of the fact that scientific laws, properly so-called, concern relationships between whole classes of facts. The cognitive ascent from the datum to the law is a rise from particularity to generality. The practical implications of this truth, though, require very cautious definition. The different situations in a single life history do constitute a class. This class is in turn composed of definite sub-classes which may be differentiated in terms of the various types of striving or, if convenient, in any one of many other ways. Thus there is plenty of room for generalization about trends within a life history. A life history includes different kinds of striving, a quest to unify ideals, a progressively differentiated interpretation of the world.

Statistical studies of the behavior of many individuals have some use for predicting the behavior of a given individual. However, principles of probability have been used most uncritically by some persons. Gordon W. Allport somewhere explains this. He notes that if we know that seven out of ten Americans go to the movies each week, it by no means follows, as some would suppose, that the American Mr. Smith has seven chances out of ten of going to the movies this week. Mr. Smith is a particular individual, truly an American, but equally truly a member of many other classes of individuals. For example, he may be a member of the Catholic Church or the Communist party. He may be one of those who is about to die of cancer. He may be one of those who dislikes the policies of the Hollywood movie magnates. He may be a Shakespeare enthusiast. Similarly, this week belongs to other classes than the class of weeks in American history. It is also a week in world history and it may be one of those weeks in which Mr. Smith's residence is affected by a flood. Depending upon his specific attitudes, many of which may be fairly permanent personal traits, and also depending upon what movies are available, it may be that Mr. Smith is ninety percent likely to attend a movie this week, or ninety percent certain not to attend. In order to learn whether a high degree of certainty exists, a case study method would have to be applied. This method would cover not only many of the relevant classes of events mentioned above, but would also involve weighting the relative importance of each class. In some cases achieving even a roughly accurate weighting of factors would be more important than achieving more than a rough estimate of the probabilities related to the individual factors.

Gordon W. Allport has also noted that one large section of the psychological profession, namely, the clinicians, claims large success in predicting behavior on the basis of evaluating single cases in multi-dimensional terms. That the chief aim of science is to realize the greatest possible accuracy of predictions in specific situations and concerning particular events may not be generally accepted by psychologists, but contemporary philosophers of science do stress that proposition. An individual's behavior could be predicted with the highest accuracy only by considering all the classes to which he belongs,

and the relationships between influences exerted by each. Psychologists of personality, like Allport and, in a past epoch, William Stern, have stressed the fact that some logically definable classes have only one member, and probably the relevance of these could be appraised, if at all, only by intuitive methods based on extensive clinical experience. Allport has argued that in order to understand a personality the psychologist's own personality must be at least as complex as the subject's. This would seem to be a necessary condition of clinical insight but not a sufficient condition.

Psychological frames of reference differ not only in regard to what data are admitted, and in regard to observational methods, but they also differ concerning what constructs are recommended as being the best devices for interpreting data. Some psychologists use mentalistic constructs, some use physicalistic constructs, and some use neutral constructs. William McDougall and his successor Helge Lundholm use mentalistic constructs as, to a certain extent, do the depth psychologists like Jung and Freud. Most so-called objectivists use physicalistic constructs. Kurt Lewin, a Gestalt psychologist, uses neutral constructs, and perhaps the constructs used by personalistically inclined psychologists, like G. W. Allport, should also be characterized in this context as being neutral. William Stern, a personalist of last generation, stated that such personal functions as language and symbolic behavior, generally, are psychophysically neutral. Allport defines attitudes as psychophysical states of readiness to respond in specific ways.

A construct is an hypothetical structure the nature of which is suggested to the scientist by the facts and relationships which he has observed. The construct must be compatible with the empirical evidence but goes beyond the empirical evidence. A person as constructively interpreted is a system of characterizable potentialities which are compatible with his observed past behavior, and in terms of which his behavior in conceivable future situations may be predicted. A constructive hypothesis is tested by further observations and especially by those rigorously controlled observational situations which are called experimental. The more often predictions on the basis of constructs are confirmed by observations, the more nearly the constructs are assumed to be descriptively adequate to reality. By descriptive adequacy is not

necessarily meant revelation of ultimate, meta-psychological reality. The neutralist believes that the workings of the substratum of behavior may be predicted in constructive terms even if those terms do not describe what a direct experience of the substratum would be like. The constructive neutralist predicts certain future manifestations of the substratum, aspects of its behavior in conceivable situations, but does not pretend to know the substratum as a "thing in itself" or to know it in a cosmic or absolute perspective. The physicalist and the mentalist both more nearly assert that they know ultimate reality than does the neutralist. Personalistic neutralists like Gordon W. Allport tend more nearly to identify their constructs with ultimate reality than do impersonalistic neutralists like Kurt Lewin. Those of personalistic tendencies strongly repudiate the ultimate beliefs of physicalists, and partly repudiate mentalistic contentions. Neutralists of impersonalistic tendencies are philosophical sceptics.

The chief justification for using mentalistic constructs is that some behavior, although not directed by conscious intentions, is as complex and seemingly as purposive as is consciously directed behavior. Automatic writing, behavior obedient to post-hypnotic suggestions, some symptoms of conversion hysteria and many other types of involuntary behavior, seem to be meaningful, adaptive and in some cases seem to presuppose something like reasoning. Phenomena of co-consciousness support this viewpoint, strongly. It has been argued that categories which are derived in the first place from the phenomenology of conscious endeavor logically must be projected upon some, or all organic activities which are not accompanied by intentional deliberation.

The chief justification for using physicalistic constructs is that some of them can be converted directly into data. Thus the dichotomy between datum and construct is bridged in part. For example, if a person deteriorates greatly in intelligence, the interpretation might be that some cerebral pathology accounts for the changes in observable adaptive behavior. Such pathology might then be observed indirectly by means of the electro-encephalogram, or directly by means of skull operations. Mind is not observable by means of the sense organs but body is observable by sensory means. Mentalistic constructs are never objectively observed but some things

which once had the status of physical constructs later have the status of being sensory data. The mentalist, of course, regards the physical constructs which are empirically validated as being simply additional manifestations of mind. He argues that organic structure, like behavior itself, may express purpose, however imperfectly. It is further argued that, while material arrangements are conceivable expressions to the finite mind of spiritual purposes, the existence of consciousness in what originally was a material world, and what is a world in which all causes are physical, would be logically ridiculous. Confronted by the physicalistic critique, the mentalist is forced to make metapsychological statements. Mentalists developed metapsychology, though, even before they were so irritated.

The chief justification for using neutral constructs is that through their use the psychologist may theorize beyond the limits set by the momentary development of anatomy and physiology without resorting to metapsychological speculation. Neutralists point out especially that neurophysiology is in a very primitive stage of development. They point out that adequate comprehension of the physical substratum even of the simplest act of learning does not exist. They point out that the physiological substratum of cultural motives is to date an entirely speculative matter. Neutralists claim that physicalists evade the task of scientific psychology by resting content with the hope that advances in anatomy and physiology some day may make an adequate interpretation of behavior possible, while actually an adequate interpretation might be approached even now were specifically psychological constructs used to correlate available data. Kurt Lewin finds in the concept of neutral tension systems which may be related in dimensional but non-physicalistic terms a device for correlating behavioral data. Gordon W. Allport applies the concept of adaptive and expressive psychophysical traits, including the object-directed attitudes. Just as biologists assume that the facts of heredity may be correlated by means of the theory of genes, and physicists make use of such concepts as those of electrons, protons, neutrons, positrons, etc., so neutralistic psychologists attempt to find theoretical constructs which are sufficiently complex in their conceivable relationships to serve the purpose of interpreting behavior and of providing a rationale of prediction, even although the con-

structs cannot be directly observed and need not be equated with ultimate reality.

Many psychologists whose writings betray decidedly physicalistic biases are totally unaware that certain propositions which they accept on faith are highly controversial. One leading American physicalist and behaviorist, though, is strongly interested in methodology, and has published several discussions which evince some sophistication. He is Clark Hull, the Yale experimentalist whose views, while being definitely behavioristic, have caused some consternation among his more dogmatic colleagues. Hull has devised such complex constructs as the "habit family hierarchy." These are designed to refute the criticisms of behaviorism which have been launched by those psychologists who believe that only teleological or quasi-teleological categories can account for the adaptive flexibility of individual behavior. A habit family hierarchy, as defined by Hull, is a system of related locomotor habits all of which can be activated by the same initial situation, and all of which, once aroused, direct the organism toward the same terminal situation. Each habit in the system differs from all others in regard to the route of locomotion which it causes the animal to follow in passing from the initial to the terminal situation. The system is a hierarchy because one of the habits is most readily aroused, a second is aroused if the locomotion based on the first is blocked, the third is aroused when the second is blocked, and so forth. Hull supposes that to learn one habit through practice is in some cases equivalent to practicing a whole system of related habits. Such ready acquisition of alternative route-habits he supposes may depend upon more generalized learning in the past such as past implicit realization that while the shortest distance between two points is a straight line, there are more circuitous lines which connect the two points, and that the less any one deviates from the most direct, the shorter it must be.

The concept of habit family hierarchies fails to help us understand why various initial situations may have equivalent stimulus values, and why various terminal situations may have equivalent goal values. As G. W. Allport suggests in his book *Personality: A Psychological Interpretation*, the recognition of abstract similarities between situations and action guided by such recognition follows a phase of activity in which

the situation is interpreted. The organism adapts relevant habits in a unique way to the structure of what is for it a novel situation. The Soviet psychologist, S. Rubenstein, holds a similar view, and argues that the character of a habit, the degree of its flexibility and ease of transfer, must depend upon the degree of adequacy, differentiation, and generalization with which the conditions are known to which the formation of the habit is related. Thus flexibility of behavior is closely related on the one hand to general traits of intelligence, dependent upon inherited total structure as modified through behavior, and on the other hand is related to the learned comprehension of abstract principles of method for conducting operations of a specific type. Hull, Allport and Rubenstein all tend to dodge such concepts as that of insight, yet the adaptive behavior which they are concerned with constantly tempts the investigator to consider insight to be the basic factor. None of these investigators is prepared to accept a mentalistic frame of reference with its inevitable metapsychological implications. If they did so they would become philosophers, and they loyally strive to keep the psychological frame of reference bounded and closed rather than continuous with the whole of human reflective activity concerning that being which confronts us and in which we participate. Such exclusivist tendencies are useful for maintaining a necessary division of labor. Philosophers, however, might well take the limits of psychological reasoning as one point of departure for the attempt to build a coherent human account of the fundamental structure of things in their totality. Only a small minority of contemporary psychologists feel that they are equipped to attempt any systematic philosophizing even if psychology be taken as the point of departure. A few, like Helge Lundholm, have made some attempts in that direction. Lundholm states that all psychological writing is metapsychological or philosophical if one frankly admits its most distant postulates or implications, and he is especially interested in defining those ultimates.

Psychologists of an earlier generation frequently were philosophers, also. William James, a founder of modern psychology, is remembered among the great philosophers. He combined certain beliefs about an hypothecated subliminal self with certain religious beliefs. He speculated that the subliminal self is a medium through

which man receives revelation from supra-human agencies. James did not accept the doctrine that there is a single mental continuum of which all minds are differentiations. He was a pluralist, and was what he himself called "a piecemeal supernaturalist." Helge Lundholm somewhere notes that a considerable number of artists, when conceiving their own state of mind as inspired, have meant that they were under the influence of supra-human powers or even of the divine power. Lundholm tends to affirm the belief that there is a general mental continuum, but he is sceptical about so-called inspired artistry. He thinks that a critical evaluation of evidence makes affirmation just as difficult as proved negation would be. Lundholm does not state that, were there a general mental continuum, certain mnemonic phenomena in it would correspond roughly to what the idea of personal immortality crudely implies. As R. F. Creegan noted in an article in *School and Society* titled "Man's Need for Immortality, and Modern Thought," survival may be conceived not in terms of the nature of the individual at a final moment, but rather in terms of a synopsis of many moments in a life history. Such a belief would presuppose the attribution of mnemonic traits to that medium within which finite existences emerge and function. Immortalization might be conceived of as relative and selective. Not every pattern of events need be retained, and retention and further development of patterns might be for short periods of time, for longer periods or for all time, depending upon the circumstances. Few psychologists are interested in metapsychological speculation of these types even although such speculation does provide a rationale for certain pragmatically necessary beliefs.

Sigmund Freud, the founder of psychoanalysis which in general has a mentalistic frame of reference, also formulated a metapsychology in his monograph titled *Beyond the Pleasure Principle*. This metapsychology is a curious blend of teleology and a kind of materialism, and it is romantically pessimistic. The ultimate aim of all life, opines Freud, is dissolution or death. The living being is said to be a being under tension, and the drive to release tension is said to be a drive toward dissolution. Life has evolved, Freud thinks, only because external irritations have forced greater complexity upon it despite its will to death. Against Freud it

might be argued that, although increases in organic complexity may be caused by external irritations, this happens incidental to living plasm's equilibration tendency. Rather than dissolution, equilibration might be the inner trend, and this might become a trend toward greater complexity whenever disturbances produce a situation in which the only alternative would be either dissolution or more complex equilibrium. In a Freudian world devolution, regression and confusion rather than evolution, progress and learning would be the norms. Contemporary social processes and wars sometimes cause the thoughtful to wonder concerning which set of norms really prevails. Freud himself, a citizen of a nation which was defeated in the First World War, did not live in an optimistic social group, and at the time when he fled from Austria to escape the Nazis, the situation warranted optimism even less than before.

If Darwinian biology is neither optimistic nor pessimistic, Freud's biological philosophy is darkly pessimistic. Darwin stated that germ plasm achieves only chance variations. As a result, the offsprings of a given species in a given generation have different survival values which vary according to the laws of normal probability. In the struggle for survival the fit variants survive and so they reproduce their chance idiosyncrasies. Although Darwin would not agree with Freud that life seeks death, he nevertheless did not believe that it seeks to evolve into more complex forms. Still it may be asked whether random, non-purposive irritation of germ plasm would result inevitably in final variations which are also normally distributed. If there is an equilibration trend in living substance, then germ plasm might respond to chance irritations by becoming more complex in a greater number of cases than it would respond by becoming more simple. The effects of disturbances might be assimilated and balance be restored by the increase in complexity. As De Vries pointed out, the geological record indicates that for the most part evolution has been through a series of mutations. Seldom have mutations been in the direction of greater simplicity of structure. Often they have been toward greater complexity. Thus while Freudian biology is pessimistic, and Darwinian is indifferent, a truthful statement would probably be

positively optimistic, stressing progressive order rather than chance. Our whole scientific frame of reference stresses causality and organization. Within such a frame of reference notions like that of learning through the survival of random response differentials, evolution through the survival of random inheritance differentials, and economic improvement through the survival of random differentials in the efficiency of industrial production represent an unfortunate and fantastic defeatism.

One of the most comprehensive world views taking its point of departure from an essentially psychological frame of reference was that formulated by the great German philosopher Friedrich Wilhelm Nietzsche. The depth psychologists have learned much from his thought, and could learn more. Nietzsche's writings sometimes had an erratic form and sometimes involved obscure symbolism. Therefore few psychologists have understood his reasoning. Its systematic structure and its bases in psychology which he called "Queen of the Sciences" are elucidated by George Allen Morgan, Jr., in his comprehensive book titled *What Nietzsche Means*. Nietzsche interpreted conscious mind as a manifestation of unconscious impulse, and the world as an expression of cooperating and conflicting wills to power. Science, he argued, should interpret all things in the perspective of their growth in power, and all organizations as more or less economical compromises among different power centers. His criticisms of the physicalistic frame of reference are among the most subtle, yet definitive statements of the teleological type of psychological and philosophical thinking.

Georg Groddeck, a German psychoanalyst, has developed a metapsychology which interprets all physiological states in teleological terms, and which hints at an idealistic world view. His *Book of the It* is a masterpiece of humorous writing, treating some serious theoretical issues with a nicely calculated flippancy and a bizarre extravagance. Carl Jung, the Swiss Analytical Psychologist, has also developed a metapsychology which tends to define all finite systems of motivation as differentiations within a universal libido or life force. William Stern, the founder of critical personalism, defends the thesis that the most all-embracing reality shares certain traits with finite persons. Like the psy-

chophysicist Fechner, Stern attributes personhood somewhat hastily to some natural systems, for example, the solar system, which do not obviously reveal any adaptive behavior.

Social psychology is still in a very chaotic state, methodologically. No one frame of reference is widely accepted by social psychologists. The attempt to interpret behavior with reference to individual variables and social variables, somehow assimilated into a single universe of discourse, presents extreme difficulties of logic and research technique. George Herbert Mead, of the University of Chicago, has made important contributions in this direction. Personality is formed by a process of integrating various rôles in social situations, Mead supposed. Those rôles were explained as having been caused by hereditary structure, intra-organic stimuli, and extra-organic stimuli. Structural development was thought to be a result of behavior itself. Percepts were defined as constructs which make situations meaningful in the context of a unique, progressive integration of rôles. Systematic thought was considered to be communication between the self and the "generalized other," and so presupposed the socialization of the individual through prior objective communication experiences. For Mead, systematic understanding was the harmonization of evidences from perspectives which pertain to different social rôles. The person plays different parts in social life yet, because he is treated as an individual, must somehow unify the trends which society considers to be contradictory. Thus the individual achieves integrated personality and a definite world view at the same time and through the same stages.

Situational psychology, as developed by such American psychologists as W. I. Thomas, attempts to discover how social factors influence the individual's definition of situations. The person is said to define the goals of his activities with reference to social norms and to those theoretical and technical facilities which his culture provides. In its most extreme development situational psychology treats even personal time and personal space as being cultural artifacts, at least in part. Few social psychologists realize that biological factors, like changes in metabolism, may also affect judgments of time. Some students of behavior believe that geographical and meteorological factors play a part in shap-

ing personal modes of perception and thought. Situational psychology seeks to discover the cultural determinants of different world views, and to discover how in turn world views affect esthetic appreciations and even affect non-esthetic perceptions. Guenther Stern has interpreted the sculptor Rodin's work through categories which are proper to situational psychology, if it be widely conceived. The German school of so-called *Verstehen* (understanding) Psychology has some affinities with situational psychology, but the *Verstehen* viewpoint is more phenomenological in an Hegelian sense, and is less concerned with causal factors.

Robert F. Creegan has suggested that social psychology should be defined as being the sociology of personal behavior. Interpreted in a social frame of reference, personal activity evinces a definite rationale which may be more or less self-consistent or self-contradictory. Some behavior conforms with the conventional ideals of status and status seeking, and so may be called status-referent behavior. Other behavior is pre-conventional. Some very complex human behavior represents a quest for more satisfactory value standards than those provided by the momentary cultural epoch. Similarities and differences between conventional, rebellious, questioning, pre-conventional and other types of behavior in different social orders are sought by social psychology as the sociology of personal behavior. R. F. Creegan, working within this general frame of reference, has attempted to interpret praise, disgust, the comic attitude, the tragic, contempt and several other attitudes which are familiar ones in Western culture as being manifestations of a basic status-referent orientation. Creegan tends to identify this orientation with the source of various inter-group conflicts, and to regard it as being cognitively defective and subject to change by education or by catastrophes which might affect social security.

Finally a frame of reference should be formulated for applied psychology. To date the various branches of applied psychology such as industrial psychology, consulting psychology, educational psychology and others, have no unifying frame of reference. It may be suggested that applied psychology should be conceived to be a component of man's engineering activities. A traditional definition of engineering is that

engineering is the art of organizing and directing men and of controlling the forces and materials of nature for the benefit of the human race. All physical engineering involves human action, usually social in character. All human engineering involves the use of physical energies and processes. Applied psychology contributes to and participates in both types. Psychological is the development of standards for selecting and placing personnel for engineering and industrial work. The laws of learning must be applied in training men to use machines and to cooperate in all working situations. Since concentration upon the job, and consideration for others, involves self discipline which may be irksome, since it usually includes some inhibition of personal desires, all engineering has its problems of worker morale and inter-personal relationships. Society as a whole survives by exploiting natural resources through applying technological knowledge, and social security presupposes cooperation as well as efficiency. The scope of engineering is as wide as the scope of planned human activity, and yet every engineering problem has its psychological aspects. Applied psychology really reaches maturity when its exponents realize these things, and realize the essential functional unity of all the applied branches.

Applied psychology must in turn contribute to theoretical psychology and its frame of reference. Man, the engineer, man, the productive being, must be understood and those who seek to make his productivity more efficient may contribute greatly to the more theoretical task. And since human benefits are the goals of all productive work, the psychological understanding of man must be involved in rationally deciding upon what those goals would be in actual practice. "Benefit," like "value," is relative to the nature of the living being. If the human being's interests correspond to any cosmic trends, then value may be absolute in one sense. That which is determined by the total trend is an absolute, and so applied psychology also might contribute to metapsychological speculation. Most of all, however, it needs some working criteria of human values, and so the applied psychologists should consult with all those of biological and social scientists who can contribute in the quest toward establishing such working criteria.

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FRUSTRATION AND AGGRESSION.

—From a systematic standpoint, a behavior sequence may be analyzed in terms of either learning or on-going action. An analysis of its learning characteristics would include such considerations as the amount of reinforcement provided by successful completion of the act, the nature of the discriminations differentially reinforced, the kinds of anticipatory responses established, and the changes in relative habit strengths of the different potential responses to the stimulus conditions present at the time the act started and ended. Clearly, it is of great importance whether the act terminated in a goal response or was met by non-reward or punishment, since the type of terminal act determines whether reinforcement or extinction of antecedent acts occurs. This kind of analysis provides the necessary information about the person's *post-act response potentialities* that must be known to permit prediction of his future behavior.

An equally important systematic problem is that of the antecedent-consequent relations within the action system itself. If a person's response potentialities are known, it becomes necessary

to specify what stimulus conditions will produce what responses. Again the fate of the behavior sequence becomes important, for if it terminates in a goal response there will be a lessened tendency to perform the same actions immediately afterward. But if there is interference, any one of a host of consequences may ensue, depending on the nature of the action and the stimulus conditions obtaining. It was to help bring order into this latter set of relations that the frustration-aggression hypothesis was originally presented (Dollard *et al.*, 1939).

The effects of frustration can best be described in their behavioral setting. The basic unit of molar behavior is an action sequence that terminates in a *goal response*, i.e., a consummatory action that reduces the strength of motivation to perform that specific action. Such responses are reinforcing, or rewarding. The antecedent conditions, both internal and external to the organism, are defined as *instigators* of the behavior sequence. When instigation occurs, the organism must often perform a series of *instrumental* acts before the goal response itself can be made; i.e., it must do things that put it in such appropriate context with the environment that the terminating action can be carried out. For example, a child who is hungry, as indicated by the fact that he has not eaten for several hours, sees bread and jam on a shelf. He climbs on a chair, puts the food on the sink, makes a sandwich, and finally eats it. The hunger is the drive-instigator; the sight of food is a cue stimulus or instigator; the preparations for eating are instrumental acts; and the actual eating is the goal response. It will be noted that the eating puts an end to the child's actions relating to food.

Frustration is any interference with a goal response or with the instrumental acts leading to it. If the child's mother had come in and told him not to eat a sandwich, he would have been frustrated because he was prevented from completing the sequence. The frustration-aggression hypothesis is that *the occurrence of frustration creates an internal instigator to aggression*. In this connection, *aggression* is defined as "an act whose goal response is injury to an organism (or organism-surrogate)." Examples of aggression include such diverse forms of behavior as complaining, hitting, ~~insulting~~, spreading rumors, cruel joking, swearing, ~~kill-~~

ing, and even self-demeaning and suicide (aggression directed toward the self.)

It is evident to the most casual observer of human behavior, of course, that every frustration is not immediately followed by aggressive behavior. In other words, the instigation to aggression is not always potent enough to overcome other responses elicited by whatever other instigation exists in the person or his environment at the time of the frustration. The *strength of any instigation* may be defined as the degree to which its response competes successfully with other simultaneously instigated, incompatible responses.

Following a frustration produced by the blocking of an instrumental act, there are often alternative acts the person can perform which will serve equally well to put him in proper position to make his goal response. Some of these may be newly reasoned out actions (progression), while others may be old, previously discarded acts (regression). Or an alternative goal may quickly be sought (substitution). Various other non-aggressive reactions may constitute part of the person's repertory of behavior that can be activated when appropriate instigation exists. Aggression must necessarily compete with all these other actions, and in many instances the strength of instigation to the aggressive reaction is weaker.

Special attention must therefore be given to the factors determining strength of instigation to aggression. There are three main ones that can be stated: (1) strength of instigation to the frustrated response. The more powerful the drive behind the original activity, the greater is the probability that aggression will ensue upon frustration. (2) Degree of interference with the frustrated response. Many kinds of motivated activity can be delayed somewhat, or the amount of reward reduced; frustration may be partial rather than total. (3) Number of frustrated response sequences. Instigation to aggression produced by one frustration may not be sufficient to compete with that of other reactions, but repeated frustration leads to a summation of the instigation produced by each incident, and hence the strength of instigation becomes stronger with an increasing number of frustrations which have not individually produced aggressive actions.

The above principles relate to strength of instigation to aggression only; they do not indi-

cate the factors that determine whether an aggressive act will actually occur. If the strength of instigation to alternative (non-aggressive) acts is held constant, however, there are three factors known to be influential in this respect: (1) the strength of instigation to aggression, as measured by the above relationships. (2) The amount of inhibition of aggression. If aggressive behavior does not remove the frustration (non-reward), or if it meets with counter-aggression from others, or if it is followed by pain, an inhibition of the particular punished act will be established. This relates only to the act itself, not to its instigation. If, on the other hand, the aggression overcomes the frustration, (3) anticipation of reward by aggression will be learned. The greater this anticipation is at a given moment, the greater is the facilitation given to the aggressive behavior, and the greater is the probability of the latter's occurrence.

There are many forms that aggression may take. These vary in respect to both their overt-ness and their directness toward the frustrating agent. The particular kind of aggression that follows a frustrating experience has been shown to depend in part on the amount of punishment anticipated for the different possible acts. In general, if there is high anticipation of punishment for overt aggression, there is a greater probability that nonovert forms such as joking and phantasy will occur.

The strongest instigation is to acts directed against the agent which is perceived as having been responsible for the frustration. Since the frustration-induced instigation to aggression is presumably identical for all frustrations, however, there is generalization of response, and to some degree every frustration produces instigation to every aggressive act in the person's repertory. Hence, if there is sufficiently strong inhibition of the aggressive acts that would be directed toward the frustrating agent, there can be an apparent displacement of the aggression toward other objects. Since the inhibition of the direct aggression is itself a frustration, there is an increased strength of instigation toward the other (displaced) objects. This provides for the appearance of over-determinedness so often noted in the case of displaced aggression.

In this connection it is important to note that aggression may be turned toward the self if all other objects threaten too much counter-aggression. Suicide, masochism, martyrdom, and

self-derogatory acts of many kinds are often examples of this tendency. However, since self-aggression is a relatively painful procedure, there is normally a good deal of inhibition of it, and in its more extreme forms it must be considered a kind of final desperate effort to secure a non-threatening object for aggression.

In some situations, for example in economic depressions, the actual frustrating agent is either impossible to detect or is vested with so much power that no aggression is possible. When whole groups of people displace their aggression toward some single and convenient target (e.g., a group detectably different from the frustrated majority, as Negroes, bankers, Jews, college professors), scape-goating is said to occur. This process, horrifying when observed as a mass phenomenon, is an instance of the collective displacement of aggression by the individuals composing the group.

One final point must be made with reference to the operation of the frustration-aggression relationship in the individual. Aggression is defined as a goal response, and hence one of its characteristics is that the occurrence of aggressive behavior reduces the immediate strength of instigation to aggression. This provides for the phenomenon described by Freud as catharsis. The instigation to aggression has the properties of a drive; it demands an appropriate goal response and will summate with later frustration-induced instigation until such response occurs. Inasmuch as aggressive behavior is widely inhibited in all societies, each individual carries with him at most times an existing instigation which is being constantly strengthened. An outburst of aggressive behavior eventually ensues, and the instigation is reduced. Such reduction eliminates the myriad imperceptible actions, or "tentatives," that are continuously being made in an effort to overcome inhibition and find a safe outlet for the great bulk of instigation to aggression. These tentatives necessarily interfere to some extent with non-aggressive adaptive social behavior, and the person gives the appearance of being tense, irritable, easily distracted. Following his final outburst of aggression (catharsis), however, this interference with adaptive social behavior disappears, leaving him calm, friendly, and efficient in his interaction with others.

The sources of frustration become increas-

ingly social as the child grows up. While it is entirely possible for an adult to be frustrated by his own limitations or by purely physical events, the vast number of secondary drives that involve interaction with other people make it probable that many of his frustrations will arise from a failure of effective social relations. Other persons serve as tools in many behavior sequences, as for instance, showing approval, making love, buying things, etc. If they do not cooperate, frustration results for the person seeking such instrumental compliance.

The reasons for this failure to cooperate may lie in the asker's ineptitude at indicating what he wants, or in the cooperator's inability to provide it. It is evident from the definition of aggression, however, that the cooperator may produce frustration for the asker, simply as a means of aggressing against him. Effective aggression by one person toward another is always a frustration for the latter. If, in such a case, the frustrated asker then aggresses toward the cooperator, the behavior may be called counter-aggression.

The social psychological principle involved may be stated as *aggression elicits counter-aggression*. The dynamics within the individual are the same as all other frustration-aggression relationships; this principle is simply a shortcut statement of a specific application of these to the social interaction of individuals.

From a genetic standpoint, the frustration-aggression relationship may be supposed to develop through the operation of adaptive learning. This aspect of aggressive behavior has not been widely explored, but an extension backward into the life history of the principles that determine the modification of aggressive behavior at adult levels would lead to such a conclusion.

One effect of injury to biological organisms is to make them withdraw from the injurious situation. Another is to elicit in them trial and error activities designed to remove the source of injury. Both these effects appear to be universal, and it is likely that the infant early learns to utilize them in his control of other persons. The infant's crying may at first be a reflex reaction to pain, but he soon discovers that adults not only come to him and remove the sources of his pain when he cries, but that they also express dislike for the noise. Since he secures gratification by the instrumental activity

of crying, this response becomes a secondary goal response and the adults' reactions to the crying become secondary goal objects. There are many other actions the baby can perform that bring about this same reaction from the parents, wetting the bed, sucking his thumb, non-cooperation, refusing to talk or eat, hitting, etc. Such actions are usually elicited in the first instance by a frustration that instigates trial and error efforts to eliminate its source. After a few months' experience with the success of these various techniques, all of them associated with frustration-induced instigation, the child learns to use them regularly for easing whatever pains he may have. In the final stage, the injury of others (aggression) becomes more or less independent of instrumental effort and assumes the role of a secondary goal response in its own right.

Historically, these conceptions have their root in Freud's analysis of the role of frustration in human development. In the early thirties, Dollard began to seek coordinating principles of motivation to assist him in the interpretation of culture conflicts between such social groups as the Southern whites and Negroes. He formalized the basic statement that the fundamental antecedent of aggression is frustration. In 1936, he and a group of psychologists, psychoanalysts, sociologists, and cultural anthropologists were brought together in the staff of the Institute of Human Relations at Yale to develop a systematic science that would bridge the gap

between the individual and his society. *Frustration and Aggression*, an exposition of some of the basic principles given above, and of their interpretive implications for such group phenomena as war, crime and political structure, was the first major publication of this group of collaborators. Subsequent publications have come from many sources and are primarily of a research character designed to test, modify and amplify the hypotheses. A complete bibliography of relevant reports has not been published, but most of the more important ones can be found by reference to the bibliographies of the books and articles listed below.

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GENETIC PSYCHOLOGY, EXPERIMENTAL.—

[The following article attempts to outline major trends in experimental genetic psychology of to-day. The reader is reminded that genetic psychology does not completely coincide with child psychology; from the tremendous amount of work dealing with the psychology of the child only problems and studies have been selected that are concerned with development in its various aspects. For general surveys of the field vid. the following publications: Munn (129), Murchison (130), Nat. Soc. Stud. Ed. (133), Monroe (124), Goodenough (62, 63), Barker-Kounin-Wright (12), Carmichael (31), Werner (180).]

A. GENERAL PROBLEMS

The design of pertinent experiments in genetic psychology depends on the manner in which the concept of development is formulated. The two contrasting approaches to psychological science in general—conveniently labeled the mechanistic and the organismic approach—are reflected in the literature on the development of human behavior. Having existed always side by side, each of the two approaches has dominated for a long time separate areas of child psychology. Non-experimental, mainly clinical and observational studies of development usually championed the notion of "the child as a whole" whereas experimental child psychology naturally was bent on the discovery of elementary detail.

The last decades have witnessed an increasing shift from the mechanistic toward the organismic point of view in the field of experimental genetic psychology. Due to many factors, such as the successful introduction of experimental methods into the psychology of personality, social psychology, and clinical psychology, the emergence of the Gestalt movement, etc., the conviction has been gaining ground that analytical procedure and holistic approach are not mutually exclusive. It therefore seems safe to predict that the gap still existing between ex-

perimental genetic and clinical child psychology will, eventually, be bridged.

Two notions in general seem to underlie the mechanistic conception of many older experimental studies of development: (1) the notion that changes are necessarily continuous and that mental forms, rudimentarily present at birth, unfold by degrees, in merely quantitative fashion; (2) the notion that growth can be defined as a mere increase in complexity, or a gradual accumulation of mental elements.

In recent years, much experimental work has been conducted in support of the conception of qualitative and discontinuous changes during development. Significant advances have been made by research workers who are directing their effort toward the characterization of genetic levels in terms of developmental patterns of organization rather than in terms of aggregates of elementary functions.

Salutatory versus Continuous Changes. The inspection of physical growth curves, of gradually increasing test scores, the observation of steadily rising learning curves lead psychologists to the conclusion that continuity is a basic property of development. In their zest to quantify mental life by analogy to physical events they became quite oblivious of the fact that discontinuity rather than continuity is a basic characteristic of biological, and even physical activity. "All our experience," says Lecomte Du Nouy in his remarkable book on *Biological Time*, "leads to the admission that continuity exists nowhere, and that one of the rôles of consciousness is to manufacture continuity from discontinuity" (48). All the principal facts of physiology support this view: the existence of a threshold of nerve excitation, absolute and relative, the propagation along the nerve in terms of electrochemical explosions, the all-or-none law of nerve stimulation, and various other equally well known facts point to abruptness, selectiveness as a basic sign of life processes.

Continuity as a property of development has been "manufactured" by a twofold manner of

handling the data: (a) by not only measuring, but also interpreting development solely in terms of overt achievement; (b) by averaging individual, abrupt scores and thus obtaining a composite curve that pictures continuous growth.

The number of child psychologists that are not entirely satisfied with this method of approach and with the results obtained by it, is increasing. They see the lack of proportion between the elaborate measurements of a great many data and the often trite conclusions derived from them. Only little is added to our understanding of development by finding that the number of words, the length of sentences, the span of attention, the ability to reason, etc., rises steadily with age. These psychologists are also certain that the leaps and bounds of individual curves, often blotted out by the emphasis on achievement and on group scores, are significant symptoms of processual changes underlying overt performances. The modern genetic analysis is beginning to take cognizance of the emergence of novel functions, of the creative reorganization of mental elements that take place during growth.

Even within the area of *physical development* which many psychologists look upon as the prototype of continuous growth, the change of emphasis is clearly noticeable. Developmental anatomists like Wingate Todd advocate a shift away from purely quantitative measurements of isolated somatic elements toward examination of changing textures and configurational patterns. Though it might not be possible to subject these patterns to perfect quantification they can be profitably ordered in sequences of maturation (52). If individual curves of physical growth are combined, not in regard to average ages but according to their shape, that is to their crests and troughs, discontinuous changes of growth rate become clearly visible (120, 121, 162).

Investigators such as Honzik, Freeman Flory, a.o., studying *mental growth* longitudinally, by individual curves, found rates of growth consistent only over short periods (78, 53).

The disagreement that still exists between those who find evidence only for continuity, and those who argue for discontinuity seems to be less based on differences of techniques used than on the general methodological approaches

that direct the formulation of the experimental problems and procedures. McGraw, for instance, contended that infantile motor development is an entirely gradual and continuous event; this conclusion she drew after having observed two infants five days every week for many months (114). On the other hand, M. Shirley found considerable evidence that many new behavior items emerge, full-fledged, by fits and starts (160). Her inferences were based on examinations of 25 infants, so closely spaced as to make observation virtually continuous, and on daily records kept by the mothers. The difference between the results does not seem to be caused, as it has been argued, by the wider spacing of Shirley's observational periods as compared with McGraw's; it springs from the two experimentors' different aspects of observation. Results derived from an analysis of *elementary functions*, and results, coming from observation of *patterns*, cannot easily be reconciled.

Genetic Aspects of Mental Organization. For those who are searching for genetic patterns the analysis of mental organization at different developmental levels becomes a central task. In order to determine the changing nature of mental organization one must have a framework of genetic concepts. Generally, organic development can be defined as increasing differentiation and centralization—or hierarchic integration. We have attempted previously to show that less differentiated forms of organization are more "syncretic," more "diffuse," more "rigid"; they are also less hierarchically integrated (180, p. 53).

If several mental functions, which would appear as distinct from each other at a more mature level, are merged into one activity, we may speak of a "*syncretic*" phenomenon. An illustration is a dream image, containing several meanings to the dreamer. A "*diffuse*" structure lacks articulation, that is, discrete parts related strictly to each other and the whole. Primitive drawings of children are examples of diffuse or "global" forms. *Hierarchic integration* points to the domination or control of motor, sensory or emotional behavior by higher functions, such as concept formation and reasoning.

Evidence is accumulating that, in accordance with these laws of development, organization is *less differentiated*, more homogeneous at earlier levels than at more advanced stages. This seems to hold even for the most general *mind-body relationships*.

To be sure, the wholesome organism is a well integrated entity; many studies of the last decades were devoted to the problem of the relation of mental age to physical growth. Though this relationship may not hold from individual to individual (41), it exists if extreme groups are taken into consideration (23). As is well known mentally superior children have been found physically superior; feeble-minded children physically inferior (77, 172). Olson's and Hugh's studies of the growth of the child as a whole and their conception of organismic age are outstanding recent contributions to this problem (137).

On the other hand, psychophysical integration does not exclude the effectiveness of the law of increasing differentiation and specification. According to Lazarsfeld, the correlation between physical and mental growth is higher at lower age levels (grades I to III) than later on (106).

Many studies have been devoted specifically to the genetic analysis of *mental organization*. Garrett, Bryan and Perl, examining 9 to 15 year old children with a battery of ten mental tests, reported a decrease of correlation between abilities tested, and increasing age. The authors concluded that "in young children ability is amorphous to a greater degree than later. . . . The rôle of general ability is minimized in favor of special abilities as the child grows older" (56). In particular, functions such as verbal-, number-, spatial abilities, and general memory, seem to be more closely related to each other in children than in adults. The trend toward specialization is again noticeable if correlations are computed between school achievements at various age levels. The decrease of correlation between arithmetic and vocabulary scores will be noted if one compares the coefficient of .52 obtained by Thorndike for school ages, with Garrett's results indicating a coefficient of .21 at the college level (55). Anderson, Monnin, Balinsky, a.o., also found changes of behavior from generalized to specialized forms of activity (5, 125, 10). Asch's work suggests that intercorrelations between various performances in childhood, though higher than in infancy, decrease during adolescence (9). His factor analysis indicates that a considerable portion of the reduction occurs with the factor of "general ability." The trend toward specialization arising from generalized intellectual be-

havior can also be inferred from studies that compare school achievement with the performance on a general mental test. The following table summarizes some of Cyril Burt's findings indicating a decrease of correlation between a reasoning test and school achievement (29).

Age r	10/11 78	11/12 81	12/13 64	13/14 59
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Using Spearman's terms, the results mean that from the twelfth year on the influence of the general factor *g* on the individual's achievement decreases, the influence of factor *s* increases. Similar conclusions were reached by Marbe and Sell who correlated general school performance and chronological age (117).

Another aspect of genetic changes of organization concerns the increase in *hierarchical integration*. Fairly well established is the fact that the rates of growth of different functions are quite different (.95). It strongly suggests, as Asch pointed out, that functions most significant at earlier periods are displaced in subsequent periods by other functions (9). The shift of significance seems to be caused by the emergence or strengthening of functions that possess a higher degree of subordinating power. Obviously such functions must have at least one of two characteristics:

(1) They must, by their very nature, be able to govern other heretofore independent functions. This development, known in neurophysiology as encephalization, reflects itself in the emergence of "higher" intellectual activities which are destined to control "lower" ones (180, p. 40). Thus, emotions become intellectually controlled, abstract conceptualization of the environment replaces concrete perceptual organization and so on. Later on this aspect of mental genesis shall be discussed more in detail with respect to various areas of behavior.

For the moment, it might suffice to mention a number of studies that illustrate the more general implications of this problem. Outstanding among these studies is the work by N. Bayley (14, 15). Mental growth was traced through the first three years; 61 infants were tested during this period with respect to sensory, sensory-motor functions, and adaptability to objective situations. Results suggest a shift of dominance of functions taking place during early development. The Sigma scores plotted separately for the sensory-motor, and the adap-

tive activity indicate an increase of the former functions up to six months followed by a sharp decline, and a steady increase of the latter function. In other words, a shift of dominance has occurred, after the first half year, from sensory-motor activity to functions of higher integrative power. Richards and Nelson, studying 80 infants, found a similar shift of dominance from a "general motor" toward a "mental" factor of intellectual alertness (151).

(2) A function may gain a high degree of integrating power because of its changing relation to the total personality pattern of the growing organism. Depending on the need—or motivational, system of personality, certain functions may gradually acquire a central rôle. Shifts of dominance of this sort correspond with the process of individuation and therefore are an important topic of a genetic psychology of individual differences as well as personality in general.

Two illustrations may be presented that demonstrate clearly the emergence of integrating factors within the growing personality.

Razran, studying simple conditioned responses in children found the susceptibility for conditioning increasing up to five years of age; from there on the susceptibility decreased. "The decrease in the speed of conditioning" concludes Razran, "is due to the emergence of a new factor . . . the children become more 'unwilling' to be conditioned." In the opinion of Razran, this new factor is a central attitudinal one: making its first appearance at the year level of 3-5, it is most probably connected with the child's growing capacity for conscious control (146).

Another example is afforded by a widely investigated topic, namely the development of color and form abstraction. As is well known, children, between 3 and 6 years of age, group colored geometrical shapes together more frequently on the basis of similarity of color than of form. Older children increasingly more often classify according to shape (180, p. 234). However, superimposed upon the general development is a trend toward individuation. This trend of individuation results in differences between two types, sometimes called the "form perceivers" and the "color perceivers." According to Tobie, typical attitudes of this sort become more and more effective, starting at the early school age (174). From that time on

tendencies in abstraction depend increasingly less on the general maturity level because integrating and consistent personality traits are developing which hierarchically control the individualized patterns of personality.

The final ambitious goal of experimental genetic research directed toward the analysis of organizational pattern is a comprehensive theory of *ontogenetic phases*. The possible existence of such phases is unwittingly admitted even by those writers who, though insisting on continuity as an intrinsic property of development, are, at the same time, willing to accept a division into genetic periods such as early and late infancy, childhood, prepuberty, adolescence, and adulthood.

Some writers such as the psychoanalysts, Piaget, Ch. Buehler, Spranger, a.o., have attempted to outline ontogenetic epochs and to interpret their organismic meaning (50, 26).

Freud's early stages of libidinal organization (oral-analgenital) are well-known. So are his genetic stages emerging from the dynamic interrelationship between the principle of pleasure and the principle of reality (Infantile and early childhood: ruled mainly by principle of pleasure; later childhood: repression, sexual latency, and early sublimation of sex drives, early superego development; puberty: peak of libido sublimation; adolescence: integration of sublimated libido and reborn sex drives, maturation of superego) (50). Entirely different in scope is the genetic scheme offered by Ch. Buehler. Based mainly on the experimental findings of the Vienna laboratory, Ch. Buehler distinguishes five phases, each of which are characterized by a change in the relation between the growing self and the growing reality (26). Piaget's attempts are directed toward the distinction of stages with reference to specific rather than general activity, such as causal reasoning, or moral judgment. Some of his distinctions will be discussed later.

All these various interpretations contain probably a greater amount of hypothetical elements than the available data warrant; but they function as valuable stimulants in an area in which the danger of an overflow of research that lacks principal ideas is, perhaps, greater than in any other field of psychology.

Developmental Laws and Learning. The general laws of development, as stated above, transcend the distinction between maturation and learning. Any true learning consists essentially in the reorganization of behavior in terms of

increased differentiation and integration. Many neurophysiologists of to-day hold that, physiologically, the processes of maturation and learning are of the same nature. "The conception," remarks Coghill, "that a neurone grows during a period of maturation, and then ceases to grow and becomes simply a conduction in a fixed mechanism, is erroneous, and wholly inadequate to account for the function of the nervous system as a mechanism of learning" (34, p. 83).

Notwithstanding the basic identity of the processes of maturation and learning, there remains still the problem of the relation between innate development and development by practice through external stimulation. Experiments have been designed to investigate the effect of maturation by comparing children reared under conditions of restricted activity and stimulation with normally trained control subjects (44, 76, 114). Gesell, employing identical twins as experimental subjects convincingly demonstrated the importance of maturation in early development. The twins' behavior in prehending pellets and in other situations conveyed an almost uncanny degree of identity in the details of posture attitude, hand attitude, and mechanism of grasp (58). Another interesting illustration of innate development is afforded in an ethnopsychological experiment by Danzinger and Frankl (38). Albanian children are so bandaged in their cradle during the first year that they can move neither hand nor foot. Unbound for experimental purposes they were unable at first to handle anything; but during the next two hours they covered all those steps of manipulation for which children of our civilization require many months.

The results of the many experiments conducted in this field lead to the conclusion that the relation between maturational and practice factors varies depending on the level of organization, on the biological relevance, etc. The less primitive an activity is, or the farther it is removed from the sphere of biologically essential performances, the more important becomes the factor of practice. But even for the highest forms of activity experiments have confirmed the educational principle: that training is more successful with those children whose maturity corresponds with the activity in which they are being trained; it is less successful with children who are below that maturity level (27, 86).

B. SPECIFIC MENTAL PROCESSES

1. *Motor Action Patterns and Their Development.* The developmental law of increasing differentiation and hierarchic integration is clearly observable in the field of motor action.

Experimental evidence brought forward by the students of human fetus behavior (Minkowsky, Hooker, a.o.) has given little support to the older view that action patterns develop primarily through the synthesis of specific reflexes (124, 79). The primary response is "diffuse" or "global" and is perhaps best described as a *focalized mass reaction*. Clearly seen on younger human fetuses, it is a response that is most intense close to the stimulated part of the body; it fades off toward the more remote bodily regions.

Further development seems to occur in two directions. One leads to individuation, or specification of the focalized mass response. The other leads to the hierarchic integration of several focalized responses, that, initially are little coordinated with reference to one another (180, 82).

Hooker's work furnishes an excellent illustration of the process of *individuation* in the human fetus. The young fetus of eight weeks responds to facial stimulation with a neck- and upper-trunk movement. Later on, the movement expands caudally. By fourteen weeks, the massive movements have become circumscribed and specified; the fetus responds now with a number of discrete and specific movements (79). The process of individuation has been observed in various activities of the neonate, such as sucking, smiling, grasping (16, 43). Sucking, originally involving many of the facial muscles, narrows down eventually to lip movements. Similarly, during the first six months, grasping includes the activity of the whole body.

The increase in *coordination*, or integration, has been found to be achieved in two ways: (a) by inner differentiation within a hitherto diffuse or massive movement; (b) by synthesis of several specific movements into one differentiated activity. Halverson's cinematic studies of infantile prehension present excellent illustrations of the first type of development. During the first year, prehension patterns change, following each other in this sequence: (1) simple palmar grasp; (2) palmar grasp and thumb opposition;

(3) fingertip grasping. This trend is again noticeable in the genetic shift of dominance from the arm as a whole toward the distal parts: in early infancy the hand functions as an extension of the arm, later on the forefinger and thumb govern the course of arm movements (67).

Increase of coordination of relatively independent movements has been studied by Sherman, Ch. Buehler, a.o. These authors analyzed the increasingly more efficient movements of the infants in their attempt to remove disagreeable pressure applied to the face (158, 27).

Since it forms an indivisible whole, primitive motor action lacks plastic adaptability. Experimental studies by Lewin, Gottschaldt, Werner, a.o., suggest an inverse relationship of rigidity to chronological and mental age (107, 64, 182).¹

Pertaining to the growth of adaptive behavior is a further significant development, namely, the growing differentiation between the organism and its objective environment. The primitively acting organism is intimately bound up with the concrete situation: the infant and its environment are almost one; his actions are immediate and concrete, lacking the guidance that comes from the acknowledgment of the objective qualities of the world.

Thus, decrease of immediacy of action signals a development through which the organism gains greater freedom of movement. This genesis has been studied by experimental devices that test the degree of indirectness of behavior. Following the lead of Koehler's work with apes, Gottschaldt, Alpert, Lippmann and Bogen, a.o., have reported on the rising ability of the child to master the environment by indirect action; this involves the use of circuitous routes, instruments, and the ability to delay and to plan (64, 2, 20, 108).

Growing spontaneity of action is still another indication of the differentiation of the child organism and his objective environment. Seen neurophysiologically, the great motor systems that are little subjected to voluntary control—the autonomic and the extrapyramidal systems—seem to precede genetically the voluntary system. The very young child is "stimulus-bound" (Goldstein); he is passively subjected to the stimuli of the surroundings. During the first year, according to Buehler, spontaneous, that is, searching and exploratory movements increase from 0 to 30% of all movements registered.

Strong stimuli of sound and light at first cannot be mastered by the organism: hence he reacts negatively to these stimuli by crying, turning away, etc. Later, at about six months, the predominantly negative responses change to predominantly positive reactions; this is an indication that the child organism has learned to "digest" intense stimulation (27). Many other reflex-like responses undergo a similar change. For instance, the Moro startle pattern, at first mainly extensor in nature, is later replaced by a primarily flexor pattern that presages movements of embrace. Similarly, the Babinski reflex of the infant develops into the plantar reflex of the older child (32, 79, 60).

On the objective side, we observe a growing ability to act with reference to the material characteristics of things and situations. According to Buehler and Kautsky, children, from the end of the first year on, become more and more aware of the specific material nature of things; their ability of adequately handling material (sand, blocks) grows considerably during the second and third year (27).

We may add that genetic characteristics of motor action can be observed also in experiments on primitivation. Dembo, Lewin, Barker, Patrick, a.o., have shown that a frustrating situation may cause a momentary regression of motor behavior (11, 139). Such development in reverse leads to stages of decreased differentiation and hierarchic organization. In their recent work, Barker, Dembo and Lewin achieved frustration with children, 2½ to 5 years of age, by placing a transparent screen between the playing child and a number of desirable play objects. The effect of the frustration could be determined in terms of regression to a genetically lower stage of play measured in points of constructiveness.

2. *Emotional Behavior.* Experimental studies have brought forward much evidence for developmental changes in emotional behavior similar to those discussed in the previous section. Main genetic trends will be briefly outlined.²

(a) First, there has been observed a genetic change from "syncretic" (bodily-motor-affective) and massive behavior to specifically emotional reactions. One of the signs of this trend is the decrease of overtness ("internalization") of the emotional response. Bayley, Blatz, Lippmann, a.o., studied the diminishing rate of crying during early age (13, 19, 108). A compari-

son of Goodenough's records on young children with the behavior of older subjects demonstrate the decrease with age of the frequency of public display of anger (61). H. E. Jones, using the galvanometric method with infants and pre-school children, found a genetic trend in the direction of inhibition of overt (somatic) expression concomitant with an intensification of visceral responses (93).³

(b) Closely connected with this development is the increasing differentiation of the emotional content. K. Bridges, in her well-known work, has emphasized the genesis of emotions from a generalized undifferentiated affect which she calls "excitement" (22). Differentiation of emotional expressions begins at a rather early infantile stage. Refined techniques, such as the use of the oscillograph by Klein, Gray and Jeffress, made it possible to distinguish the crying patterns of hunger, fear, and rage at an age level at which earlier work, employing cruder methods of observation, did not find evidence of differences of emotional expression (97, p. 7).

(c) Increase in hierarchic integration of emotional behavior is another important genetic trend. Intellectualization, that is, domination of emotions by higher functions advances with the growing child. Primitive emotions are uncoordinated, blind, momentary outbursts. Emotions of growing children are short lived and ever-shifting events. According to Jersild after-effects of anger were almost twice as frequent and prolonged in children over four years of age, as compared with those of two-year-olds (87). Goodenough, Blatz, a.o., have analyzed the increasing ability of the child to react adaptively in annoyance producing situations (61, 19). The genetic order by which emotional patterns of lower degree of adaptability are placed by those which are controlled by higher functions is excellently illustrated by Blatz' and Millichamps' study on infants (20). In the beginning, massive unadapted outbursts were found to be the rule. As the infants advanced in age, their effort directed toward the removal of an unpleasant situation expressed itself in increasingly higher forms of integrated behavior; first, adaptation occurs entirely through locomotor activity (turning or running away, etc.), later on, at about two years of age, symbolic forms of expression (hiding face, verbalization) are added to the means of adjustment. Here, as in other areas, the development re-

peats itself at higher levels; for instance, in social conflict situations, arising among school children, crying and shouting, as expressions of helplessness, decrease and become replaced more and more by the use of adaptive language (90).

Another aspect of this development pertains to the causes of emotions. The first causes are immediate and concrete. Fear, as Jersild has shown, is created in the young infant by disturbing events, such as loud noises which act in an immediate and direct manner upon the child. As the child grows older, factors of a non-immediate, imaginative, anticipatory nature become more prominent. Between the ages of 23 and 71 months, the fears of Jersild's subjects caused mainly by immediate and concrete experiences such as loud noises, pain, loss of support, decreased, whereas fears induced by imaginary creatures, darkness, and dreams, increased (88, 89). The growing effectiveness of potential danger has been studied by Jones. Jones' two-year-old subjects showed no fear if a snake was suddenly exposed before their eyes; two- to four-year-olds demonstrated increasingly more and more cautious apprehension; children over four years of age exhibited definite fear at the sight of the snake (91). The positive correlation between these anticipatory forms of fear and IQ is a further indication of the mounting intellectual control (88).

3. *Sensory-Motor and Perceptual Processes*

As in the foregoing sections, developmental trends as observed in experimental situations shall be rather summarily discussed.

Increase in Sensory-Motor and Perceptual Articulation. Experiments on drawing, writing, singing, formboard performances, etc., have shown that development proceeds from global, unanalyzed units to forms of organization, the essential feature of which is a definiteness of parts that stand in clear relationship to one another and to the whole (180).

A young child, asked to copy a geometrical pattern or repeat a tone pattern by singing, will almost invariably by his errors reveal a tendency toward a less differentiated form (183). Globally organized forms, such as continuous circular shapes, are among the first patterns that the child is able to construct correctly. Volkelt has shown that a young child is likely to represent a square or a cylinder by a circle (180, p. 118). Hildreth has published the typical first attempts of five-year-olds in number and letter

construction (75). The errors lie all in the direction of simplification, symmetrization, etc.; in brief, in a de-differentiation of the original. We have analyzed recently the development of visuo-motor performances on a "marble-board" (181, 186). The child was requested to copy mosaic patterns by putting marbles into some of the (100) holes of the board. This is what we found: younger children placed marbles in continuous sequences of holes. With increasing mental age the "continuity" type became replaced by a "construction" type. Here the mosaic patterns were built by moves which successively enclosed the form from several sides; thus the continuity of the earlier performance was broken up into part sequences. The younger child followed the total outline; the older child divided each pattern into natural parts which stood in definite relationship to one another.⁴ Heiss and Sander, by means of an ingenious block-building experiment proved that the younger the child the less is he able to analyze a perceptual whole with reference to its parts (180, p. 117).

Differentiation as Increase in Specificity. Primal forms of perception are less specific, more "syncretic." This means—according to the definition given at the beginning of this survey—that perceptual and non-perceptual functions, distinguished from each other at a more mature state, are at an earlier stage fused into one undifferentiated phenomenon. Primitive perceptions are, for instance, expressive or "physiognomic," because emotional, kinaesthetic factors and the like are intimately merged with sensory data. Experiments on perception, showing a high degree of physiognomic content, have been performed by Muchow, Gantschewa, Volkelt, and the writer (180, p. 90). The first differentiation of colors is based probably as much upon the sensory factors as on their affective values. Goldstein and Rosenthal studying cerebellar patients found clinical evidence suggesting that expressive color characteristics such as "warm" and "cold" are founded on specific bodily reactions to certain color stimuli (60). The results of a study of an early chromatic development by Staples seems to support these suggestions. Miss Staples found that up to the age of 15 months, children behaved differentially to two groups of colors: the red-yellow group appeared significantly more preferred than the blue-green group (168).

Another class of syncretic phenomena are the synaesthetic experiences. Older investigations by Bleuler and Lehmann, and more recent ones by Révész and by Zietz indicate that synaesthesia is relatively frequent in childhood and regresses with advancing age (180, p. 88).

Hierarchical Integration During Perceptual Development. With increasing age changes of perceptual organization occur due to an increase in domination of sensory processes by higher functions. On primitive levels the organism responds discriminately to sensory stimuli in terms of bodily (sensory-motor) reactions. Discrimination in terms of perceptually observed relationship, as operating in a color matching situation, obviously represents a later developmental stage. Still later the child becomes capable of fixating definitely the various qualities of the perceptual field by name-giving activity. Finally, abstract, classificatory concepts emerge that again may reorganize, in a novel manner, the perceptual field. Thus discrimination is not a unitary process; its development implies the successive emergence of quite different function patterns as the child moves from one genetic level to another. As Cook has shown, between the ages of one and a half to six years, the correct performances in a color matching situation increase from 45% to almost 100%, whereas in the naming of these colors the increase is from 25% to only 62% (36). Various experiments suggest that sensory discrimination on a non-verbal level develops early and, after having reached a peak in childhood, may possibly even decrease. Peckham, using a non-verbal form of Snellen's test, concluded that children of only 21 to 62 months possess a visual acuity similar in range to that of adults (140). According to Peters brightness sensitivity reaches its peak at about 14 years of age (180, p. 98). The peak for tactile sensitivity seems to be attained much earlier; Friedmann found even a decline of the tactile threshold after six to eight years of age (54).

This latter result seems to be in keeping with another group of findings; viz., a shift of dominance, for certain situations around eight years, from tactile-kinaesthetic (contact-receptive) to visual (distance-receptive) factors. We concluded from our results with the marble-board test that the performance of younger children was guided by predominantly tactual-kinaesthetic factors; with older children visual form

factors became increasingly more dominant. This shift of dominance occurred around the eight to nine year level (181). A similar shift was found by us in an experiment in which the children had to tap four squares in a certain order. The order was indicated previously by the experimenter in two ways: by tapping in one series, and by light signals in the other (179). It is probable that the more abstract the task, the later during development, the shift may be expected to occur. Experiments performed by Renshaw obviously dealt with such an abstract situation. Children were requested to point, with open or closed eyes to an area on their skin, that had been previously touched by the experimenter. He found a shift toward visual dominance occurring at about thirteen years of age (149).

The development of *space* and *time* experiences in the child affords excellent illustrations of the genetic law of hierarchization or intellectualization on the perceptual field. Experiments by Gordon, Piaget, Werner, E. Meyer and others have shown that space is apprehended primarily through sensory-motor activity; it is an "egocentric space-of action" (180, p. 172). During early childhood, according to Piaget, the child begins to perceive spatial relationships between objects, more or less independent of his own bodily movements. On the other hand, for many spatial relationships, such as left and right, in front of, behind, the frame of reference remains for a long time the child's own body. A still further reorganization occurs when space perception becomes subordinated to abstract, universal concepts (175). The recent ingenious experiments by E. Meyer brought new evidence in support of the interpretation of space development as outlined here (122).⁶

Another important topic of perceptual development concerns the apprehension of objects according to their *constant* properties. Animals as well as human beings are able to perceive qualities of objects such as size, color, form as relatively constant properties by making "corrections" for the variation caused by illumination, distance, or position. Chalk looks white whether seen at bright daylight or at dusk. The trend of the organism to keep properties of visual objects constant is evident at at least three increasingly higher levels. The most primitive level is the physiological adaptation to variation of illumination. The main mechanism

of this sort in man is the light and dark adaptation of the eye. This peripheral-autonomic adaptation is unstable with the new-born but develops very rapidly (40). The physiological capacity for making proper allowances for the change of illumination has been shown to exist already on a relatively low biological level. Some fishes, for instance, change the coloration of the skin in response to light; this response is dependent not upon the absolute intensity of the light rays reaching the eyes but on the ratio between these rays and the incident illumination (109). Such instances suggest that neither in man nor in fish is the physiological mechanism that corrects illumination effects an act of judgment or even of perceptual awareness. A higher level, however, requires the perceptual relation of the light reflected from the surface of objects to the total illumination of the field. The development of this "perceptual constancy" is slower than that of physiological light adaptation. However, as Brunswik and his collaborators have shown, perceptual constancy of brightness, color, shape, and size, reaches its peak along before adulthood; it declines at about fourteen to fifteen years of age (24). This decline is most likely due to reorganization on a higher plane: conceptual operations—judgments, comparisons, mental measurements—emerge as factors of control and replace partly the concrete, perceptual apprehension of the world.

4. Memorization

Many genetic experiments have been performed in this field the results of which, though not as conclusive as in other areas, are highly suggestive for a developmental theory of memory.

Development of Memory as an Increase in Organization. As one would expect, the capacity for retention has been found to increase with age during childhood.⁷ According to Starr, to the Terman-Merrill revision of the Stanford-Binet test, a.o., the normal memory span increases steadily between 2½ to 10 years of age from two to six digits. Also quite obvious are the general findings that memory span varies with the material presented. What is the cause of this increase? We know at least one of the principal causal factors; viz., the growing capacity of the child to organize material to be retained. The younger child tends to apprehend and to reproduce the material in continuous,

chain-like wholes, the older child, in patterns in which parts are related to one another and to the whole. One of our experiments with children two to ten years of age seems to illustrate well the effect of organization on span of attention. If presented with a number of digits greatly exceeding their capacity for retention, the younger children performed far below their normal memory span; older children and adults were able to retain a number of digits closer to their individual capacity. The younger children broke down, obviously, because they were unable to build a continuous whole under these circumstances, whereas older people were capable of gathering discrete items for retention.

Factors of organization seem to be related also to the *delay* of responses. Memory traces are more stable the better they are organized (Koehler, Katona); therefore, they are less easily disturbed by interfering stimuli (98). Hunter, Miles, Skalet, Buehler showed that maximum delay increases in organisms, phylogenetically as well as ontogenetically (129, p. 337; 123, 163, 27).

Development of Memory as an Increase in Specificity. Jaensch's analyses of eidetic phenomena suggest that memory image and perception are less differentiated from one another on lower as compared with higher levels. Eidetic phenomena possess certain properties of sensory as well as image phenomena. These syncretic phenomena seem to be relatively common with children, decreasing in frequency greatly around puberty (85, 102).

The trend toward specialization is noticeable also with reference to material types of memory. Most psychologists of to-day probably agree that, at least in the adult, a general memory factor hardly exists. There are almost as many "memories" as there are areas of mental operations. However, if one descends the ontogenetic scale, one should expect a closer relationship between the various areas of memory. Some experimental evidence has been brought forward in support of such conclusion. Anastasi, for instance, found practically no correlation between immediate memory for various visual material, vocabulary, and number operations at the college level. On the other hand, Bryan reported a high correlation between these faculties at the preschool level (9, 3).

Increase in Hierarchic Integration: Genetic Shift in Memory Functions. Brunswik, Gold-

scheider and Pilek performed a comprehensive investigation of the qualitative changes of memory that occur during mental growth (25). They examined experimentally the growth curves of the following forms of memory:

(a) Memory for Concrete, Digit-Like Material: One series consisted of nine unrelated movements, such as hand clapping, lifting arms, making a bow; another series contained nine colors; a third, nine simple geometrical forms. The score consisted of the number of correctly reproduced items.

(b) Memory for Concrete Relationship: Here, the same material as in (a) was used; but the score pertained to the correctness of sequence of items.

(c) Memory for Logically Apprehended Material: Stories for instance, presented by 12 pictures, had to be verbally reproduced.

The growth curves for the three forms of memory have been found to differ significantly, indicating genetic shifts of memory function during development. The curves for discrete, concrete digits increase up to ten to twelve years, declining somewhat after that age. Curves for concrete relations show a considerable rise up to fourteen years; after fourteen years the increase is steady but slow. Curves for logically apprehended material rise slowly till twelve to fourteen years and rapidly during adolescence.

Earlier work by Winch and McGeoch also seem to be related to the problem of memory levels. In Winch's experiment children were presented with a simple picture; the score consisted in the number of items recalled. Winch reported a peak of the growth curves for these concrete items at about seven to eight years of age (188). McGeoch used three types of material on children nine to fourteen years of age: (a) cards picturing simple objects; (b) a picture entitled "the disputed case"; (c) a carefully rehearsed event. Memory for single concrete objects (a) improved up to twelve years: the recall scores for the picture, and the event (b, c) were found to rise steadily. The scores for the report on the event showed a definite spurt between twelve and fourteen years of age (113).

The various experimental results, though not conclusive, indicate a shift during development in terms of the replacement of a lower memory function by a higher one.

5. Concept Formation and Reasoning

a. *Concept Formation.* In no area of genetic

psychology is the controversy over facts and interpretations as intense as in that of children's thought. The disagreement pertains to basic questions such as whether children's thinking develops gradually or in spurts, whether the difference between childlike and adult reasoning is one of degree or quality.

In terms of "achievement" only, and particularly when results are based on average scores taken from a great number of subjects, a steady increase in thinking efficiency is observable. However, analyses on the achievement level only are apt to obscure specific changes of the processes that underlie the achievements (178).

A good illustration is afforded by the development of abstraction, as studied through sorting tests. Here the child is requested to group a number of objects, or figures, of different sizes, shapes, and color. Results of such experiments, plotted in form of a developmental curve, indicate a quantitative increase in the classifying ability. But the analysis has to go further before one can give a satisfactory interpretation of the psychological factors involved in the development. Such further analysis has been performed by Weigl, Usnadze, J. Thompson, a.o. (180, p. 239; 173). The results indicate important changes that occur in the psychological processes involved in sorting. According to Usnadze, the young child is able to group according to only one category (size, color, etc.). Moreover, there is little freedom of choice in this "one-track-abstraction." Certain conspicuous concrete properties of the objects seem to force the child to unite visually the objects. There seems to come together, almost automatically, the blue objects, the yellow ones, the green ones, etc. This perceptual cohesion between objects on the basis of one category prevents the child from rearranging the field in terms of other properties. A deliberate shift from one category of grouping (from color to shape for instance) occurs only with older children; it involves processual changes, proceeding from "primitive abstraction" closely allied to sensory organization toward an abstraction guided by deliberately selected categories such as size or color. If this interpretation be correct, the development of abstraction cannot be defined simply as gradual. Another illustration of the genesis of abstraction, with processual changes similar to those occurring in classification experiments can be found in the develop-

ment of the number idea. Number in its most primitive form is intimately related to body activity. The fingers in particular present a primordial visuo-kinaesthetic number schema. We have shown recently that a definite relationship exists between the development of the number concept and that of the "finger schema" (184).⁸ The next important step involves the emergence of "concrete numbers"; that is, numbers given as perceptually organized units. We have conducted experiments that suggest a close relationship between the ability to apprehend optical dot configurations and the ability to operate with numbers (185). Still another processual change occurs during the transition from concrete numbers to abstract number concepts.

6. Reasoning

Syncretism (Concreteness). In spite of the violent controversy over many essential traits of childlike reasoning, there is agreement on some of these traits. For once, there is agreement as to the concreteness of lower forms of reasoning. In our own terminology less mature forms of thought are more syncretic, that is, thinking is closely bound to emotional, sensory-motor, and perceptual activity. The young child does not apprehend abstract concepts, or general laws of causation. Experiments performed by Piaget, Raspe, Muchow, Werner, Huang, Deutsche, Heidbreder and others give us some insight into the development of causal reasoning (142, 143, 180, 80, 81, 46, 72, 73, 104). A standard procedure consists in the performance of a simple experiment in physics before the child. For instance, the experimenter cuts a sheet of paper into two equal parts; he leaves one piece smooth and presses the other into a little ball. He then drops both pieces simultaneously to the floor, and asks the child to explain the greater falling speed of the paper ball. Younger children did not distinguish between mere description and explanation ("the little ball falls 'cause you crumpled it"). On a higher level the child apprehends some of the specific, concrete conditions ("it falls quicker because it's heavier"). Experimental devices of this sort make it possible to analyze the development toward higher forms of reasoning in terms of universal, abstract, and necessary causes. Even a group experiment, such as the one performed by Deutsche, and that, in regard to technique, is

open to severe criticism, shows the development from a "phenomenalistic" type of explanation to abstract reasoning (46).

Logical inferences have been studied genetically by Stern, Hazlitt, Piaget, Strasheim, Laycock, H. T. Muller, and others (170, 70, 143, 171, 105, 128). Most authors agree that inferences can be formed at a very early age; however, these operations are often difficult to discern because of their extreme concreteness. W. Stern holds that primitive forms of inference are neither inductions nor deductions; they are "transductions"; that is, transitions from one concrete isolated judgment to another coordinate single judgment. Syllogistic reasoning in particular has been studied rather recently by Muller. Employing subjects ranging in age from seven to seventeen years, Muller found that younger children tend to represent the premises by imagining concrete situations, a tendency that diminishes with increasing age (128).

Strasheim's extremely ingenious experiments deal with the application of previously learned problem solutions to new situations. Strasheim was able to distinguish between two developmental stages: at the "perceptual stage" the child apprehends a relationship necessary for the solution in intimate contact with the concrete elements of the presented situation; thus, the relationship is available for transfer only if the new situation contains similar concrete elements. At a higher genetic stage the relationships are definitely abstracted, and are therefore most effective for future transfer or "eduction" (171).⁹

These experiments demonstrate that thinking develops from syncretic forms to forms that are more or less detached from perceptual and emotional functions. Other experiments are especially devoted to the genetic study of hierarchic concept formation. Many methods have been devised for this purpose, such as the technique of definition (Barnes), the method of matching of objective relationships that vary in the degree of hierarchical order (Line), the technique of sorting objects representative of concepts (Welch), and many others (12a, 107b, 177).

Lack of Articulation. Many genetic psychologists agree also on another trait of child thought, probably closely linked with that of concreteness. This trait concerns the formal structure of thinking. The structure of thought shows little articulation; that is, the young child tends

to reason either in terms of indivisible thought units, or in a chainlike, associative fashion. Gottschaldt, Lewin, and others demonstrated experimentally the rigid totality nature of primitive problem solving behavior (64, 107). To illustrate: a young child had learned to use a stick to draw toward him objects that lay outside of a fenced-in area. When the whole arrangement was moved to another corner some of the least mature children continued to run to the previously used corner and tried in vain to reach the object.

Experimenters have noticed also another peculiarity of the problem solving behavior in young children: a lack of the conception of the goal as a centralizing factor with reference to which the various elements of a more mature procedure are integrated. This difference between lower and higher forms of reasoning behavior has been variously described as "paratactic" versus "syntactic," as "associative" versus "planful," as "chain-type" versus "goal-related" behavior. This difference is well illustrated by block-building experiments. Very young children concentrate on each single placement of one block after another; older children construct in terms of larger units to which small steps are subordinated. According to Gottschaldt's analysis immature children, presented with a lengthy task, lack the feeling for the lessening distance of the goal, a feeling that in older children changes with every step as the action approaches closer and closer to fulfillment (180, p. 208).

The synthesis of two experiences learned singly is difficult for an individual who acts in terms of chains of rigid action units. According to N. Maier the ability to unite into a novel experience two previously learned experiences is a function of age (115, 116). Maier's assertion that associative learning is the predominant intellectual activity of the young child is in accord with Strasheim's conclusion. This author claims that "bare retentivity or its special form, associative reproduction, plays by far the greatest part in the young child's mental life. . . . The fact that this is the more primitive stage explains to us why there is a constant tendency to relapse into it, even when the later stage has been attained" (171, p. 208).

The Problem of Qualitative Stages of Reasoning. Are there, during development, observable patterns of reasoning sufficiently distinct from

one another to justify an interpretation in terms of genetic stages?

As discussed before, if we restrict our efforts to the calculation of mean age scores and developmental curves of achievement, the essential goal of genetic psychology, viz., the understanding of the processes of growth can never be achieved. The concept of the child as an imperfect adult may be sufficient for practical applications, such as measuring the mental or educational status; it seems, however, wholly inadequate as a guiding concept in an integrated analysis. The problem of genetic levels is intimately linked with this argumentation: one cannot logically believe the child to be more than an imperfect adult and, at the same time, discard the concept of organizational levels.

At this point it might be advantageous to discuss some of the misconceptions about the problem of qualitative levels of reasoning that have arisen in recent experimental literature.

(1) The genetic concept of qualitative differences has been criticized for the reason that adults often display behavior similar to that found in children. This seems to be the belief of Abel, Deshaies, Cameron, a.o. (1, 45). However, the demonstration of primitive behavior by adults has hardly ever been overlooked by those who advocate qualitative levels: on the contrary, it has given rise to important considerations of the following sort: (a) Developmental sequences repeat themselves at various stages of maturity. (b) Primitive levels do not completely disappear during development, but become merely subordinated to higher forms of activity. Only because of this fact is it possible to conduct experiments on primitivation in adults; these experiments were of great help in the study of qualitatively different levels of human behavior.¹⁰

(2) Another misconception centers around the problem of gradual versus sudden development. The belief in gradual development and the belief in qualitatively different stages are not necessarily mutually exclusive. A stage may be characterized by the predominance and frequency of forms of behavior "critical" for that stage. One might, therefore, reasonably expect a good deal of overlapping of lower and higher forms of behavior. This is particularly true when calculations are derived from a great many subjects. Thus, with respect to frequency of dominant characteristics the concept of

gradual development may be applied to qualitative stages; but this does not mean that it necessarily pertains to processual changes. There are some, who still believe trial and error to be the prototype of problem solving behavior; they are opposed by those who, like the Gestaltists, find the essence of reasoning in sudden, insightful reorganization. Experiments by Harter, Roberts, Jones seem to suggest that trial and error behavior is the more frequent the more artificial the relationships are that have to be detected (69, 154, 92, 59). In truly meaningful situations suddenness of part or whole solutions seem to be the rule rather than the exception (Alpert, Kreezer and Dallenbach, Hazlitt; 2, 103, 70).

(3) Much controversy stems from a confusion of the concept of qualitative differences with that of innate differences. It has been argued, for instance, that children reason in a primitive way only because they lack the fund of knowledge that education later on provides. This argument is irrelevant as to the problem of qualitative levels; it refers solely to the relation of maturation to training. With few exceptions little effort has been put forward toward an analysis of this relationship. One comprehensive experiment, conducted by Williams under the direction of the writer, has been concerned with the influence of experience upon children's concepts of causal relations (187). Children six to ten years of age were first requested to explain simple physical experiments, such as the rise of water level due to the immersion of an object. Later on they were provided with some experiences related to single factors that were involved in the demonstrated event. Afterwards the first experiment was repeated. The results indicate that certain experiences were capable of lifting the children's causal concepts to a higher level. But the results also show that there are limitations to this advancement corresponding with the child's state of intellectual maturity.

(4) Other arguments concern the relation between reasoning stages and chronological age: Piaget's and other writers insistence on a definite relationship between levels of reasoning and chronological age have brought about undue criticism of the concept of thinking stages per se. The criticism is justified in so far as the levels of reasoning cannot be considered to be a matter of chronological (or mental) age

alone. They depend, to a large extent, on the nature of the task at hand, its difficulty and familiarity; they also depend on the child's psychological environment and on his training. We may, therefore, not be able to identify stages of reasoning in terms of mean chronological ages. We may, however, quite reasonably, direct our effort toward the analysis of developmental sequences of thought that are less strictly related to chronological age. It has been generally found, for instance, that Piaget's subjects, coming, as they do, from poor homes, were retarded in concept formation when compared with children employed by us and other investigators. We also found that, with respect to explanations of—psychologically—remote phenomena, such as clouds, lightning, rain, etc., children remained for a longer time on a primitive, ego- and anthropomorphic level than with respect to interpretations of common technical events. Norman Maier found that creative synthesis of two learned experiences, considered by him as the essence of reasoning, was not operating before five to six years of age. However, it must be conceded that the genetic appearance of reasoning most probably depends on the type of task involved. A good illustration is afforded by K. Buehler, Alpert, Richardson, a.o. (28, 2, 152). For instance, a piece of biscuit was placed slightly out of the infant's reach, with a string attached to it. A child, one year of age, in general, is able to secure the biscuit by using the string. Before that age string and biscuit obviously are two different experiences for the child. One may therefore assume that the ability to synthesize and to reorganize two experiences into one novel action develops earlier in a simple sensory-motor situation than it does in a situation like that of Maier in which rather complex space relationships are involved.

In concluding this discussion, one might predict that the controversy concerning genetic stages of reasoning will finally be decided through longitudinal studies based on individual experimental analysis.

7. Speech

Considering the importance of speech for human behavior, surprisingly little has been contributed by genetic experimental psychologists to our understanding of the development of language. Most of the valuable contributions come from systematic observations, not strictly

experimental in nature (C. and W. Stern, K. Buehler, Bean, Nice, Markey, Lorimer, Guillaume, a.o.; 169, 28, 17, 136, 119, 111, 66).¹¹

Three aspects of language will be briefly discussed: (a) the aspect of external form; (b) the semantic aspect; (c) the functional aspect.

Probably most thoroughly studied is the development of external form. Differentiation of sentences as well as words out of "holophrases" (one-word-sentences), the increase of syntactic over paratactic sentence structure, the differentiation of word categories, etc., were analyzed by McCarthy, Fisher, Smith, a.o. (112, 51, 165, 166).

Few experimenters, mainly French (Decroly, Guillaume) and Russian (Vigotsky), have studied semantic development (42, 66, 176). In this country, a promising technique was developed by Scott and Myers: children of the fifth to the eighth grade had to interpret a number of concepts from history and politics. One of the interesting results of this study is that words were often used correctly without knowledge of the correct meaning (157).

The functional aspect of language is manifold. One of the functions of language is *representation*, or *symbolization*. Modern neuropsychologists, such as Head, on the strength of their clinical evidence, are inclined to consider symbolization as the essence of linguistic function (71). During early stages speech and gesture are molded into one undifferentiated form of expressive behavior (Nice, 136).

Naming as the central process of representation undergoes a development that we previously attempted to outline by the following hypothetical schema (180):

- (a) the name as a material property of a thing (dynamic "word realism")
- (b) the name as a concrete physiognomic picture of a thing (concrete word dynamics)
- (c) the name as a physiognomic diagram of the concept (abstract word dynamics)
- (d) the name as an algebraic-like sign of the concept (abstract word algebraism)

Another important language function consists in *communication*. The development of the communicative function is closely related to the social and individual development of the child. As will be discussed later, during growth the polarity between the person and his social

world increases. These processes of individuation and socialization advancing steadily with the growing child are faithfully reflected in the speech area. Language starts as a predominantly egocentric phenomenon that differentiates in two directions: there is an increase in the communication with others: socialization; but there is also an increase in the communication with oneself: inner speech development.

Experiments on *linguistic socialization* were instigated particularly by Piaget (141). Originally, the child's speech does not fully take into account other persons as listeners. The older the child, the more he becomes motivated to formulate his ideas in regard to the listening person. A tremendous decrease in egocentric speech seems to occur between three and seven years of age. Percentages of egocentricity reported for early childhood range all the way from 60 (Piaget) to 4 (McCarthy). The study by Smith corresponds closely with the results of our own investigations. We found a decrease of egocentric speech from 40 per cent at the two-year level to 20 per cent at the four to five year level (141, 112, 166, 180). Experiments on the development of *inner speech* were initiated mainly by Vigotsky (176). He found that, compared with the true inner speech of the adult, egocentric speech of young children has a higher social connotation: if these children were brought together with deaf and dumb children, egocentric speech decreased. As the person grows older, egocentric speech becomes more and more the medium through which the person communicates with himself and clarifies his own ideas. With the exception of Vigotsky's work, this writer does not know of any attempt devoted to the genetic analysis of the process of internalization of language.

8. Personal and Social Development¹³

Growth of individual personality and social development are interdependent processes. This interdependent development can be defined as growing differentiation, or polarity, between the person and his social world.

Ego and world are maximally fused in early infancy. As the child grows, he increasingly differentiates himself, in experience and in action, from his surroundings; reciprocally, the social world with which he communicates unfolds in its specificity and complexity.

Socialization. The young child's empathic

identification with his personal surroundings, its growth toward an articulate ego-world relationship have been beautifully demonstrated in L. B. Murphy's experimental analyses (132). A good illustration of the highly egomorphic world of the young child is seen in the frequent occurrence of the imaginary playmate, the self-dramatization in play situations, and the like (18, 118).

The changing relationship between the growing person and its world is usually preceded by periods of crises, of which three have been particularly pointed out by child psychologists. These are the periods of weaning, the resistance period, and the negative phase of puberty. Experimentally best documented is the resistance period, particularly through the work by Caille and Reynolds (30, 180, p. 453). The genetic significance of the resistance period does not solely lie in the growing assertion of the self, as often has been said. This period plays a singular rôle in the process of socialization; it is relevant to the genesis of *moral-social attitudes*, such as *obedience*, sense of *duty*, etc., that, according to Piaget, Buehler, a.o., develop during the preschool years (144, 27). This is clearly indicated in an interesting study by Klein (101). Klein observed a change of process patterns underlying the development of the attitude of obedience. Before a noticeable rise of resistant behavior, that is, during the first year, obedience is "blind"; it occurs in terms of simple stimulus-response reactions. Later on, during the second and third year, the child becomes inclined to "give in" only after deliberation; this change shows itself objectively in an increase of the frequency of hesitation and protests before obeying. During the elementary school years, the obedience pattern undergoes a new change. McGrawth questioned children of preschool and of elementary school ages and found that most of the four-year-olds, but only half of the seven-year-old children, appreciated the necessity of the act of obedience (23, p. 45).

Child behavior primarily controlled by strict obedience points to a comparative lack of differentiation between ego and personal surroundings. Thus the just mentioned changes of obedience patterns signify a developmental increase in the polarity between the individual and its social world. Piaget analyzed this development, particularly during the later school years, by means of most ingenious experimental

devices (144). He studied the social attitudes of children united in a "society" of their own; the children were members of groups who played a traditional Swiss game, the marble game. According to Piaget, egocentric forms of social relationship, authoritarian in nature, undergo a fundamental transformation at about the ten-year level. Before that age level is reached the "law" of the society, i.e., the rules of the game, is thought of representing an authority, superseding the will and desire of any member. In later years the authoritarian law becomes the "law of the people"; it is the free pronouncement of the mind of the individual as a member of the group. Some findings by H. Hetzer seem to support Piaget's conclusions (74). Hetzer, observing children's games in the streets of Vienna, found that up to ten years social games were preferred which are built on rigid and very specific rules; older children favored games with rules general enough to leave greater freedom of action. Piaget discovered a similar development pertaining to moral ideas, such as justice. He defined three stages: justice based on authority, on equalitarianism, and on equity. Since these levels depend greatly on cultural determinants, the chronological ages corresponding with these stages probably are not as fixed as Piaget seems to assume. Harrower, for instance, was able to confirm these stages for children of lower but not of higher socio-economic status (68).

Individuation. Another significant trend concerns the increasing appreciation of oneself and other persons as discrete and unique individualities. A number of experiments dealt with the genetic change from an egocentric level of self-esteem and evaluation of others, found in young children, to a more objective attitude of older children.

Greenberg's experiments indicate that objective appreciation of others in a competitive situation is unfrequent before the eighth year (65). Again, younger children expect good school reports independent of their actual achievement. According to Buchler, an objective attitude toward oneself cannot be expected before the nine-year level; from nine to thirteen years, school reports were increasingly more often judged in terms of "fairness" of the teacher (27). The reason for this change seems to be related to another genetic trend: the younger child judges himself and others mainly in terms

of concrete conduct; the older child becomes more and more aware of inner motives and enduring personal capacities. This development has been excellently demonstrated by Piaget (144). His experiments have shown that the idea of guilt, first related to the physical effects of a person's action, changes to a concept of responsibility based on inner motivation. The development toward "internalization" of personality traits can be inferred also from the well-known findings by Clein and Smith (33). Their results indicate that, during high school years, the attitude of children with respect to habits, such as swearing and drinking, becomes gradually more tolerant, whereas the attitude toward character traits such as conceit and selfishness, grows less tolerant.

The older the child grows the more complex becomes his personality structure in terms of differentiation of specific traits and regions of activity exhibiting those traits. It is of course impossible to list all the principal experimental results of this development. Only one more significant trend may be mentioned; viz., that toward consolidation, or stabilization, of traits and of growing flexibility. A good illustration of this tendency is furnished by a study by Schuler (156). Schuler, employing adolescent boys as subjects, found an increasing differentiation of behavior as to dominant and submissive characteristics. For older boys there is a greater stability of basic-dominant or submissive-behavior patterns within a general environment, but at the same time it becomes less possible to predict such tendencies in another general environment.

In conclusion: socialization and individuation are but two aspects of the same polar development. Higher forms of integration appear, as H. H. Anderson has shown in his significant studies, when the individual spontaneously and flexibly responds to differences in other persons (4). Dominant behavior, for instance, is in its pure form egocentric and rigid; domineering leadership is genetically inferior to leadership in terms of highly integrated, plastic behavior. According to Pigor's investigations, this latter form of leadership does not make its appearance, in general, before the age of nine or ten (145).

Primary Development of Group Behavior. Much experimental evidence supports the theoretical supposition that groups and group be-

havior develop in terms of differentiation and hierarchic integration.

A number of studies have been concerned with the increase of social activity and with the decrease of solitary play during early growth (21, 74, 110). We may, in particular, discuss briefly the results of experiments on the development of groups with reference to complexity, articulateness, and stability of organization.

Complexity. The number of group members increase with advancing age. In general, during the first year of life, direct social contacts are limited to two individuals at a time. Not before he reaches school age will the child, in general, spontaneously participate in the activity of a well-defined group composed of more than three members (27, 189, 138).

Articulation. Primary relationship between group members is egocentric, the interaction between them rather loose. The homogeneous, vaguely integrated character of primordial groups has been well observed in the "parallel" play of children. A higher step has been determined by Parten and Newhall as "associative" play; here the group is united by a common activity, such as road-building, but the structure is still ill-defined and division of labor lacking. Better articulated groups develop in the "co-operative" play. In cooperative play there is division of labor, group censorship, centralization of control, and subordination of the individual aspiration to that of the group. Parten and Newhall found clear evidence of a relation between age and degree of group organization (138). One cannot, however, accept these genetic relationships as dependent on age in an absolute manner: genetic steps of this sort are apt to repeat themselves whenever the child meets with a novel, more complex situation. This is well illustrated by the development of group behavior at the elementary school level, as studied by Reininger (148). The beginners' class as a whole displays, at first, a low form of group structure that possesses all the characteristics of a crowd. Organization grows through the initial forming of a few isolated nuclei. The nuclei are small units, each having its leader. Further organization develops by the merging of the enlarged nuclei and by the differentiation of the rôles assumed by the group members.

Stability. Many observers in genetic social psychology have commented on the developmental

trend toward stabilization, duration and definiteness, of groups and relations within the groups. Russian psychologists have shown that during Kindergarten age groups exist only for a very short time. Only one third of the groups observed remained intact for longer than 20 minutes. During school years groups grow in endurance; however, larger groups are less stable than smaller ones. In general, it is not before the age of eight to ten years, that relatively larger groups—such as boys' gangs and girls' club—begin to form (47, 190).

Definiteness of group relations have been measured in terms of consistency of the bond between group members. Moreno, by means of his sociometric technique, demonstrated the relation that exists between age and the degree of certainty with which a child chooses another child as a preferred partner (127).

The beginnings of the development of a rank order in terms of superiority and inferiority, of relations of equality and rivalry have been observed in children as young as eight months old. Development of stabilization of rank order relationships between members of larger groups has been studied by Reininger (147). Here again, as in other aspects of social development, the ten-year level seems to be the age mark of important changes. Before ten, these social relationships are vague and fluid; afterwards, rank order becomes increasingly more definite and stable.

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NOTES

¹ A favored experimental set-up for the study of flexibility is the mirror situation. Ketterlinus studied the age increase of an adaptability to motor tasks presented by means of a mirror (100).

² Literature pertaining to this field is well summarized in: 97, 22, 88, 61, 132a.

³ Galvanometric methods, measuring the electric skin phenomena, have been used also by Wechsler, Crabb and Freeman with pre-school subjects, and by Collmann with school children (97, 35).

⁴ Cf. 150.

⁵ The decrease of visual, auditory, and tactual acuity from the twenties on, reported by Miles, is probably not of a psychogenetic order.

⁶ Cf. also Emerson's study (49).

⁷ Pertinent experiments by Starr, Hurlock-Newmark, Lumley-Calhorn, McElwee a.o. marized in Munn (129, pp. 339-340).

* Finger schema denotes a spatial image of the fingers as differentiated parts of the hand.

⁹ Education is a term coined by Spearman (167).

¹⁰ Concerning experiments on primitivation of (180, p. 38 f.).

¹¹ For summaries of recent genetic work in the linguistic area, cf. Lewis (107a), McCarthy (112), McGarahan (113a), Anderson (7), Sanford (155).

¹² Comprehensive surveys can be found in Murphy-Newcomb (131), Jones-Burks (97), Anderson (6), Arrington (8).

GENIUS.—The term "genius" is used in two closely related, but somewhat different, technical senses in contemporary psychology. In the first sense, as popularized by Terman, it refers to any individual having high intellectual ability as measured by an intelligence quotient of over 140. Some writers refer to an intelligence quotient in the vicinity of 140 as being "near genius," reserving the term ("genius" for intelligence quotients over this amount. Others feel that an intelligence quotient of as much as 180 is the point where the term genius begins to apply. Used in this sense, genius simply means high intellectual ability, varying in the sense of being a strictly normal deviation from the average on the plus side. Although still current in this usage, and still sometimes used coterminously with the concepts of "precocious" and "prodigy," there has recently been the tendency to refer to such individuals as "gifted" because of the highly evaluative connotation suggested by the words "precocious," "prodigy," and "genius."

Some writers also include in the term genius individuals with special aptitudes independent of the findings in terms of the generalized intelligence quotient. Genius as used in any of these senses belongs to the particular field of differential psychometrics.

Genius is also used in psychology as in the more popular meaning to refer to unique achievement in some form of the arts or sciences. The technical usage roughly corresponds to the popular usage here in supposing that, although genius is based on high abilities or talents, the term should refer to attainment rather than to potentiality. Many students have shown that there is undoubtedly a very high correlation between the specific attainments of the individual genius and his intellectual abilities, but this correlation is not perfect and there are certainly cases of attainment which

amount to genius in individuals who would not arrive at any outstanding score in the standardized intelligence tests. The concept of genius based on potentiality alone then does not allow for a study of the motivational factors which turn only a relatively small number of gifted individuals into actual productive geniuses.

Earlier philosophical theories of genius, which considered the genius to be directed by a particular demon or inspiration given to the soul by God or as resultant only of favorable heredity, at the present time have no adherents. The chief findings of modern psychodynamic theory, namely that the abnormal individual varies from the normal in degree rather than kind and that abnormal mental phenomena represent simply exaggerations or perversions of the normal mental phenomena, have made it necessary for us to explain the behavior of geniuses and the productions of works of genius by the same basic conceptions that we utilize to explain normal behavior and other forms of abnormal behavior. That genius is a form of abnormal behavior is not to be taken to mean a derogatory evaluation of it. It is rather to be considered as another form of behavior following the same basic psychological mechanisms. The chief problems in describing genius are the problems of the motivation in the behavior of the genius and the choice of the products of the genius as symptoms of behavior.

Although some writers on genius consider its products to be due to superior abilities representing nothing more than positive deviation from the normal, the popular view that the genius has conflicts and that the products of genius represent the working out of his struggles has indeed something of scientific validity.

Earlier theories which looked on genius as so closely related to neurosis and psychosis that all geniuses were considered special forms of neurotic or psychotic individuals are not today widely held. It is true that genius and neurosis and psychosis all have their origins in conflicts between the basic parts of the self and environmental reality. But in the genius, these conflicts are resolved in such a way that the symptoms or products of the genius are socially useful and highly valued by society whereas the symptoms of the psychotic and neurotic are without social value and may even be antisocial. Conse-

quently, the older theories, like that of Lombroso and even the more recent ones like that of Kretschmer, are not widely held today. Lombroso definitely viewed genius as akin to insanity and as an abnormal and unbalanced deviation from the normal type. Kretschmer viewed genius as the combination of great ability with pathological tendencies invariably present. Although psychosis and neurosis are undoubtedly somewhat more frequent among individuals who are to be called geniuses, there is no evidence that they are an invariable accompaniment of genius. Since the same type of conflicts produce works of art and neurotic symptoms, it is only to be expected that artists will often be nonproductive because of personal or social reasons and hence may develop neurotic symptoms. Through his life the artist may also not be able to resolve all of the conflicts in socially productive work and consequently may always suffer neurosis.

Genius may be considered to be the combined result of superior abilities which arise largely on an hereditary basis with particularly deep psychological conflicts which serve as the motivation for the productions of the genius. Of all the modern psychological theories of motivation, psychoanalysis has given us the best insight into the nature of basic conflicts and the modes of their resolution, and consequently our understanding of genius has been greatly enriched by psychoanalytic studies. According to psychoanalysis, the productions of the genius represent sublimated, that is socially accepted, resolutions of unconscious conflicts. In their sources, the productions of genius are related to the productions or symptoms of the psychotic, the neurotic and the psychopathic character. Works of genius are similar to all of these in that there is some disbalance between the forces of the id, the ego, the super-ego and reality. Productions of the genius are socially useful and so the resulting behavior is viewed differently by society. Many geniuses are neurotic and the genius is closely related to the neurotic. In some ways the genius is even like the psychotic. The genius is, however, outstanding in one very special respect. His repressions are not severe enough to prevent his being somewhat conscious of the nature of the basic instinctual conflicts.

The basic instinctual conflicts are conflicts between the "love" and "hate" instincts. The direct expression of the basic libidinal and de-

structive urges of course does not lead to the production of genius. "I love ——" and "I hate ——" are not themselves art or science, but they are the ground from which art and science grow. These basic wishes become sublimated with a great deal of distortion in content; they become sophisticated in form; and they require a unique technical competence in production which differentiates them from normal adjustment on the one hand and from the anti-social manifestations in other forms of abnormal behavior on the other hand. These conflicts arise out of the barriers placed in the way of satisfaction of instinctual strivings by society. This is the reason why the artist and the genius are so often against society or against certain aspects of society. Although other resolutions of conflict are possible, such as repression leading to neurotic behavior or regression leading to psychotic behavior, the genius resolves his conflicts through sublimation leading to specific socially constructive behavior.

The psychoanalytic theory of motivation supposes that many conflicts are on an unconscious level and are related to the various stages of psychosexual development. The productions of the genius thus represent the working out of these conflicts through sublimation with sophistication of form, distortion of content, and with a unique competence of performance. It is easy to see how the frustration of normal erotic impulses becomes sublimated into popular love poetry and the lyrics of popular songs. It is perhaps more difficult to see how frustrations which have led to repression into the unconscious become sublimated into other forms of art, but analysis of the artist and the product is almost invariably able to show the relationship between the work of art and the conflicts of the individual artists.

According to the psychoanalytic psychologists, certain frustrations and conflict situations are universal and it should be expected that these would lead to the production of an outstanding number of important works of art. Among these conflicts are those connected with the family drama and there is a great deal of evidence that these conflicts have found their way into some of the greatest art works. That the Oedipus situation has been important in motivating great works of art is of course commonplace knowledge, the name itself being taken from the great Greek tragedy. Shakespeare's

"Hamlet," Balzac's "Pere Goriot," Stendahl's "Le Rouge et Le Noir" and Proust's "Swann's Way" are all concerned with the Oedipus situation.

The plastic arts like literature, in so far as they tell stories about people, also represent recurrently basic psychological conflicts. All the great Madonnas in the European galleries celebrate one aspect of the Oedipus situation. Landscape and still life in painting to be sure offer other problems, but popularized expressions like "mother-earth," "fatherland" and "Old Man River" give us clues to the psychological factors involved. For instance, the love of fatherland and mother-country are to be sure poetic expressions, but they are images based on very early identifications. The original environment of all of us was the mother's womb.

Analysis along the lines already given, however, does not answer the question of the particular esthetic quality in the product of the genius. The basic conflict is distorted in form because of its inacceptability in immediate personal terms to the social consciousness of the individual genius. Such distortion is similar to the distortions in dream-life and in other fantastic accomplishments. Sophistication in form represents an application of the artist's peculiar style which leads to a uniqueness in performance.

In art, the content of unconscious conflict is distorted through a sophistication of form in such a way that repressed wishes may be realized. In scientific work genius varies in only one respect from art. Sophistication occurs in terms of the elegance of theories and uniqueness of performance in the performance of experiments, but the distortion rather than leading into the field of uncontrolled fantasies represents an adaptation of wishes to reality. The scientist expresses his unconscious conflicts in a way which is true, that is which can be verified experimentally. The artist expresses in a way which is beautiful. Art consists in expressing experience in a way certain observers realize to be beautiful, while science consists of propositions to which the universal consent of other observers can be obtained. Since an elegant mathematical deduction has something of beauty connected with it and a great epic poem something of truth, even this distinction is a relative one. Thus, outstanding works of science as well as those of art represent the

products of genius in that each is a socially acceptable sublimation of inherent psychological conflict.

The appeal of the product of genius to the audience is based on the fact that the audience is able to introject the distorted form of the art product or to identify himself with the protagonist and thus resolve similar conflicts of his own. Just as the artist or genius is enabled to undergo catharsis through his production, the audience likewise resolves conflicts in a sublimated form through identification.

From the modern standpoint then, genius gains understanding in its motivational aspects from the psychoanalytic study of the unconscious struggles of the genius. Genius, like all behaviors, is a function of both hereditary and environmental or psychological-field factors. The original potentiality or talent comes from heredity, but the motivation to produce comes from conflict and the type of medium also is related to the personal psychological factors which largely come from the environment. The chief mechanism of genius lies in sublimation, which is by no means the best formulated of the various psychoanalytic mechanisms, but which certainly gives us some understanding of the way in which genius works. Although a great deal remains to be understood about genius, psychoanalytic theory may be said to have made a good beginning in this field. Certainly a great deal of work remains to be done on the problems of choice of medium and the general relationship between medium or mode of expression and the nature of the underlying psychological conflicts.

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GESTALT PSYCHOLOGY.—*Gestalt* psychology is one phase of a recent general trend in the science of psychology as a whole. The general trend reached a peak in its publications in the late twenties and early thirties of the century and reflected a shift in emphasis from all forms of conventional or "orthodox" psychology, which were mechanistic or "atomistic" in their pattern, to an organismic position based on fundamentally opposite assumptions.

In a brief review of this sort it would obviously be more practicable to confine the discussion to the general features of the movement and of others logically related to it, in order to bring out if possible its wider and fuller meaning. The wider movement in psychology encompassed all of its various fields and in many instances extended into borderline areas, giving rise to new branches of science. Similar movements or shifts in emphasis occurred in all of the other sciences, and in philosophy, not excluding mathematics. Not only that, but the *Gestalt* movement was only one very small part of a vast, intricate and completely integrated change in the character of the entire culture pattern of the modern, civilized world. But still this is not the whole of the general setting. The shift in the culture pattern is one which has occurred many times before in history. At certain times in history all phases of human endeavor are dominated by a pattern of thinking and action explicitly or implicitly based on "mechanistic" assumptions pertaining to the sources of truth and right—theoretical, scientific, or practical. There result typical emphases in science, in forms or styles in art, typical trends in political and economic thought and action, even typical forms and types of warfare. When the mechanistic movement has run its course, the entire culture pattern changes to an opposite set of emphases now based explicitly or implicitly on opposite basic assumptions, the organismic. Then the culture pattern shifts back again.

Space does not permit tracing these movements throughout history. Suffice it that the antecedents of the current organismic trend in psychology can be traced back to Plato and Aristotle through those periods in history that have been organismic in character while the antecedents of conventional psychology can be traced back through the alternating periods to the Hellenistic phase of Greek history. The

last two periods in the history of psychology dominated by the mechanistic pattern occurred roughly from 1710 to 1790, and 1830 to 1910, respectively. Accordingly, the last two organismic periods occurred between 1790 and 1830, and from 1910 to apparently about the present time. Prior to the twentieth century, periods of organismic thought have been vitalistic in nature, and certain of the organismic trends within this century have been vitalistic. The dates just given are valid only for purposes of orientation. It would be better to say that on or about these dates the culture pattern was in the process of shifting from one set of dominating characteristics to its opposite set. At the present moment the general over-all culture pattern appears to be shifting back again to the mechanistic phase.

What then are the general characteristics of these two patterns, the atomistic and the organismic? (There are only these two; no others have ever existed.) Fundamentally the two patterns have to do with the question: What is basic, primary, more important or fundamental in nature, and what is secondary and derived? The atomistic pattern gives the general answer that the basic or primary thing or fact in nature is an element; a particle; an infinitesimal something; an individual thing; a unit of some sort by nature self-sustaining, independent, whose properties or attributes of necessity must be inborn, innate or inherent; a cell; a sensation, an idea, a feeling, a habit, a reflex, an instinct, a government, a nation—in other words a part of something. A part, of course, implies a whole. Accordingly, the mechanistic pattern makes certain assumptions about the whole that must agree with the first assumption that the parts come first. The part or element, therefore, is used as the building brick with which to explain how, under laws of nature, the whole came into being when something or other put the parts together. The important thing to remember is that the whole is secondary and derived, something manufactured from the parts. It has no properties or attributes in its own right; essentially it does not exist except as an aggregate or mechanical combination of the parts, like a machine such as an automobile.

The organismic pattern gives the general answer that this is all wrong and professes to prove it introspectively, experimentally, and logically. It contends that not parts or elements,

but systems (of energy), patterns, wholes—the complex as opposed to the simple—are the basic, primary, and therefore the more important facts and realities of nature. The part or element is secondary and derived from the whole, by a process called individuation. In physical science, systems of positively and negatively charged particles are the basic facts; or systems of energy obeying laws of equilibrium (Neither equilibration nor disequilibration exists among aggregates or dynamically unrelated parts.) In biology the basic fact is the organism as a whole, not the cell; in psychology it is the mind or the personality as a whole, not the sensation or individual response; in social science it is a given society as a whole, such as the State, not the individual.

No brief account can possibly give the uninitiated reader a clear idea of the gulf that exists between the two patterns, or of their incompatibility, or of the utter impossibility of blending the two into one without basically altering one or the other, or both. They are logical opposites, as different as night from day; as fascistic despotism from democracy; as communism from individualism; as rationalism from empiricism; as epigenesis from preformation; as Picasso and Dali from Landseer, Gainsborough or Fragonard; as Ravel from Stephen Foster; as modern steel, glass and concrete functional architecture from 17th and 18th century Baroque and Rococo; as atheism from atheism; as a systematic treatise from an encyclopedia; as international wars from civil wars. And for a very simple reason, the first named of all these comparisons belong to the generalized organismic pattern; the last named to the atomistic pattern.

In order to get parts put together into wholes the atomists must resort to mechanisms or expedients of various sorts such as bonds, attractions, repulsions, affinities, association, social contracts, or just chance, because in the beginning, by definition, the parts are not naturally related to one another, dynamically; there is in the beginning no organization, integration or interdependence. Scientific laws are supposed to pertain to the machinery by means of which the complex is obtained from the simple, the orderly sequence from unconnected events, the whole from the part, or else the laws are merely statistical. If the parts are already in an organization of some sort already

possessing form, order and dynamic relationships to each other, then they did not come first after all; the whole, with its parts already integrated in time and space was the primary fact. This is the organismic position. Hence scientific laws must pertain to the manner in which parts move or behave, or change, in already integrated systems of energy. Organismic laws pertain to the behavior of wholes, not to the process of putting parts together to make wholes, not even when the process is getting water from hydrogen and oxygen because in that process more than the two gases are involved, namely pressure, temperature, electrical, thermal and gravitational fields, along with charges and differentials in potential, all of which have quite as much to do with the manufacture of water as the gases themselves. The situation holds for any kind or form of synthesis, fusion, blending, mixing, transformation, patterning, or concatenating whatsoever.

With a few exceptions the psychological literature of the nineteenth century was mechanistic. The outstanding pattern was that of association psychology based on the mechanical laws of repetition, recency, or frequency, and the influence of pleasure and pain upon the formation of associations. This viewpoint was taken over by the conditioned response school—the behaviorists. Behaviorism and bond psychology, incidentally, were hold-overs from the 19th century, as was Titchener's structuralism—examples of cultural lag. It can be shown that during each of the mechanistic periods of history, some type of behaviorism or association psychology or its equivalent prevailed.

The first symptoms of the transition from the mechanistic to the organismic pattern were appearing during the eighties and nineties, and can, in general, be summed up as the rediscovery of *continuity*, or unity in time. The next step was the re-discovery of *unity* and its implications, *i.e.*, unity in both space and time. Wundt's acceptance of apperception; Fechner's effort to find a systematic relationship between mind and body; James' unsuccessful but brave fight against the atomistic pattern, and his "stream of consciousness"; the British concept of conation; the concepts ideomotor action, striving, drive, subconscious, the self, and the like, belong to this period. The next step was exemplified by the work of Ehrenfels on "*Gestaltqualitäten*," and Dilthey's emphasis on psy-

chological wholes, in short, in a rapidly growing realization expressed by many authors (especially the Graz School) that psychological processes cannot be explained completely by reducing them to elements. A given mental state possessed an attribute of its own later to be designated as a "field property."

The main break took place first in Germany with Wertheimer, Köhler and Koffka, particularly with Wertheimer's work on apparent movement (1912), Köhler's experiments with apes that demonstrated transposition, insight, and goal-directed behavior as opposed to blind trial and error; and Koffka's work on perception and learning. Other investigators were at the same time breaking the old traditions. Mechanistic assumptions led to the seeking of a one to one relation between cause and effect, stimulus and response. As early as 1909 Katz found that this implication did not hold in his studies of color. Rubin further upset common notions about perception and memory in his figure-ground experiments.

The mechanists had no way of explaining how a given process such as a reflex, habit, or instinct—or for that matter, anything—got started, traveled the course it did, and finally stopped, without endowing the act with a great many mysterious, self-directing powers. As James once said, the important problem is *not* how B came to follow A the second or the tenth time, but how it happened to follow A *the first time*, before any bonds had been formed! New insight into this problem came to light in Wertheimer's famous concept of "closure," a variety of the more general principle of energy systems "seeking" stability in equilibrium.

Early in the development of Gestalt theory Köhler pointed out that the old difficulties and the new problems were by no means confined to psychology. Physical science had corresponding part-whole problems. Köhler's observations were published in 1920 in "Die Physischen Gestalten." Meanwhile, and of earlier origin, developments in physics—relativity, the quantum theory, wave mechanics, the new theory of the atom—were already breaking corresponding traditions and rapidly turning to organismic principles. In 1929 Schroedinger, a physicist, borrowed the term Gestalt from psychology (Köhler in particular).

Meanwhile, also, biology was having similar troubles, especially in embryology. The cell

theory was utterly impotent to explain the phenomena of growth. The organism consisting of billions of separate cells of different kinds was not a product of cellular multiplication at all, fundamentally. Multiplication turned out to be a *by product of division*. Division was the basic process. That meant that the whole came first even if it was a small one. This was the cue. Throughout growth the parts came from the whole, not the whole from the parts. As De Barry, a botanist, said many decades earlier. "The cells do not make the plant; the plant makes the cells." The upshot of this simple but profound reversal in thinking was a revival of earlier forms of epigenesis, teleology and all, dressed up in scientific clothes to fit the twentieth century. C. M. Child's principle of "regulation" of growth by the organism as a whole through physiological gradients; Coghill's emphasis upon individuation, a concept going back through Spencer, Coleridge, Casper Wolf, William Harvey, Duns Scotus, to Aristotle; the vitalistic assumption of "organizers" and "entelechies" (Driesch) but nevertheless a recognition that parts are conditioned by wholes, and other related concepts and trends, burst forth in biological science.

A renewed study of the causes of monstrosities that heredity could not possibly account for—transplantation of tissues from one part of the embryo to another in its earlier stages of growth; studies in symbiosis, ecology, animal and insect societies, altogether built up a tremendous organismic literature in this field. Perhaps most striking of all was D'Arcy Thompson's "On Growth and Form," first published in 1917 (second edition in 1942), one of the most scholarly, thought-provoking books of the century.

The Gestalt movement was slow to get under way in this country and at first met with bitter opposition. American psychological thought was firmly entrenched in the mechanistic pattern in three important directions as late as the second decade of the century. One was Titchener's introspective structuralism, the second was Watson's behaviorism, and the third was Thorndike's bond psychology. Actually, however, names and schools are far less important than the over-all culture pattern that prevails at the time. American thought was dominated by the mechanistic, individualistic spirit of American economic, social and political life which de-

veloped throughout the nineteenth century and was fostered by a large continent to conquer. This atmosphere dominated all schools and instruction—content and methods—from the elementary grades to the graduate schools. Add to this, geographic isolation and complacency, and the stage was set for as vigorous an opposition to organismic thought in science as to socialistic trends in political economy.

Among the first to notice the new movement were George Humphry who interested himself in its applications to the learning process and education; R. M. Ogden, who translated Koffka's "Growth of the Mind"; Harry Helson, who published extensive reviews of the literature in 1925 and 1926; George Hartmann, who wrote "Gestalt Psychology" in 1935; W. D. Ellis, who wrote "A Source Book of Gestalt Psychology" in 1938; and Wheeler and Brown.

Just as modern non-Euclidian geometries hark back to Lobachevsky and others in the early part of the 19th century, and as modern epigenesis harks back to Cuvier and his followers, so modern work on the functions of the cortex hark back to Flourens of the same organismic period. The outstanding name in the twentieth century movement in this country is K. S. Lashley. The cortex functions piecemeal fashion according to the mechanistic view. A particular function like seeing or hearing is located in, *i.e.*, it "resides" in, a particular cortical area. According to Lashley's studies, this view must be radically altered, at least from its extreme form. Wheeler, Bartley, Newman, Perkins and others insist that the cortex functions as a whole no matter what the organism is doing or to what it is responding; that there may be specialization but not localization of function; and that specialization of function is open to an explanation in terms of gradients comparable to those assumed by Child and Coghill in physiology and embryology.

Perhaps the most concentrated form of organismic psychology is found in Wheeler's "Laws of Human Nature," 1931; "The Science of Psychology," 1929, 1940; and Wheeler and Perkins, "Principles of Mental Development," 1932. After a search in the histories of the different sciences, Wheeler concluded that in a logical sense the basic laws in all were the same; that they were laws of the behavior of energy systems of whatever kind; that this was the reason why, after all, we have a Universe

(one world) and call it that; that various phenomena could not possibly be integrated with one another unless this was true; that the majority of the most important scientific contributors to science down through the centuries had always implied or stated this fact; that these principles were the basic laws of human behavior. Accordingly he boiled down the results of his historical research into a set of "Organismic Laws" with which he transposed from physics to biology to psychology, to social science, and from one division of psychological subject matter to another, in the fashion of Oswald Spengler, F. C. S. Northrop, George P. Conger, and numerous others.

Originally associated with Köhler in Berlin was Lewin, who applied the technique of topology to problems of goal-directed behavior. The individual lives and moves in a physically and socially structured field, a situation capable of being portrayed by topological figures. J. F. Brown, a follower both of Köhler and of Lewin, extended this method to a systematic social psychology, "Psychology and the Social Order," 1936, and into the field of abnormal behavior, "Psychodynamics of Abnormal Behavior," 1940, where he combined the principles of psychoanalytic theory with Gestalt psychology.

It is characteristic of organismic times to break down departmental barriers and hence to adumbrate new branches of science, although the effort sometimes results only in pseudoscience. Examples of this sort are found in the several efforts at characterology and typology, all of which were based on the assumption of the psycho-somatic unity of the individual as a whole. Kretschmer's classification of body types into pyknic (frequently associated with extroversion), aesthenic (associated with introversion), and athletic (ambivalent) is an example. There are many others.

The general movement in psychology away from sensationism or any emphasis upon elements of consciousness or elements of response, to an emphasis on the personality and its adjustment, and on social behavior, followed the trend in general toward wholes. A similar reaction against "brass instrument" psychology occurred in the culture psychologies of Europe.

The movement in psychology and psychiatry toward Freud was also typical. Organismic cultures are always more subjective and introspec-

tive in character than the mechanistic, with an inclination, in occidental countries, toward eastern mysticism.

Both the organismic and mechanistic patterns pass through their brilliant phases, sinking into decline before the pattern changes to its opposite. One of the symptoms of the decadence with which organismic eras always terminate, a symptom traceable through centuries of time, is a hyper-sex consciousness associated with moral decline, nudism, lowered physical vitality and a decline in the birth rate. Whether or not the student of modern society would admit that we have passed through a period of decadence in the last twenty-five years, the fact remains that the civilized world became hyper-sex conscious, along with waves of public necking, nudism, increased promiscuity, and a decline in the birthrate. This is obviously one reason for the great popularity of Freud and psychoanalysis. Similar trends in medicine, even to the same emphasis upon dream analysis, symbolism, the subconscious, and sex can be found during decadent phases of the various organismic eras as far back as the periods of decline in Rome and Greece. Declines in the birthrate also occurred during these periods. The conclusion is inescapable that the decadence is to a considerable extent due to lowered vitality and that the undue emphasis on sex is an effort to compensate for that lack. When the race is the strongest it seems to be more puritanic, and less sex conscious; when it is the weakest, it seems to be less stable, less puritanic, and more sex conscious. Be this all as it may, the emphasis in psychoanalysis upon the personality as a whole and its struggle for internal balance is definitely a move in the direction of the organismic pattern. Neuropsychiatry, also, was not without its strong organismic representatives as in the case of Goldstein whose point of view is found in his book, *The Organism*, 1938.

As time went on the structuralists, behaviorists and bond psychologists became less extreme, less skeptical, and in many cases adopted ideas from the organismic movement, *i.e.*, they more or less joined, later, the trend of the period that was historically "on time." Tolman's emphasis on goal-directed behavior, Hull's hypothetical-deductive approach, and Thorndike's adoption of "belongingness" are cases in point. There are others too numerous to mention.

Education shifted from a rigid departmental-

ized system based on drill, bond psychology, and hedonism to liberalized curricula and methods intended to provide integrated experience and to develop integrated personalities; thus, education strongly participated in the movement as a whole. Special orientation and survey courses were provided, and an effort was made to make schools "student centered." The purpose of education became to develop insight and the comprehension of things in relation—wholes.

Logic and philosophy were not immune to the general change in the thought pattern. Induction, empiricism, materialism, pluralism, hedonism, all gave way again to rationalism, neo-Platonism, idealism, monism, an interest in methodology and the logic of science, and in broad, sweeping, universal principles—in short to a philosophical presentation of the part-whole problem with the use of organismic principles (Bradley, Bosanquet, Bergson, Whitehead, Northrop, Reiser, the "Viennese Circle," Conger, *et al.*). A new journal, "The Philosophy of Science," was motivated by this change.

Space forbids giving an account of similar movements that took place in the social sciences: sociology, economics, political science, and history. Suffice it that the trend was associated with an emphasis upon the reality of the State or large social group, treated as an integrated whole, a natural object of a kind in its own right, as opposed to an aggregate of interacting individuals. In practice the result was a turn to the left or to fascism in both of which the social part, the individual, was subordinated to the social whole, the State. During mechanistic times the State is subordinated to the individual and during organismic times the individual is subordinated to the State, hence a high correlation exists through history between mechanistic cultures and the growth of individualism and democracy, on the one hand, and on the other, between organismic cultures and the rise of absolute monarchs, or totalitarianism in any one of a great variety of forms, including communism. The socialistic writings of the past, as of the present, generally belong to the same culture pattern.

A very interesting development in organismic science of which psychology is yet hardly conscious, but in which it is definitely involved, is that of human ecology. Included in this movement is a rising interest in the effect of weather

and climate upon human health, vitality and behavior.¹

The mathematician has often said: One does not really understand algebra until he has struggled through the intricacies of higher, abstract mathematics. Truly it is not possible fully to comprehend the significance of the early contributions, in Gestalt psychology, of Wertheimer, Köhler and Koffka, until one has laboriously studied the corresponding trends not only in all of the other sciences, but in the world of human action as well in the past where history has been made, and in the present where history is in the making.

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¹ See article on "Climate and Human Behavior" in this encyclopedia.

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HYPNOANALYSIS. — As with almost everything else, it has transpired that the psychotherapeutic wheel has come about full circle. Techniques which were hastily although somewhat regretfully abandoned in the past are now believed to have some value, and there is evident a general movement pointed toward the re-evaluation of clinical procedures and tools. Under the stimulus of the war, and faced by the dire prospect of a virtually endless stream of psychological casualties not only from the front but from the homelands as well, it has become important to sift our knowledge in the hope of finding handy tools with which to operate. At the same time, this is not to imply that the methods and instruments to which we of science return are the same antiques we abandoned in the forward flight. Rather it would appear that the inevitable march of time has supplied us with the knowledge to utilize them in a more serviceable and expert manner, to which the special insights of the laboratory and praxis have contributed. It should further be remarked that there is a visible boldness in our manner now that was heretofore lacking, and that it is perhaps just this quality by itself which accounts for the success that meets current psychotherapeutic efforts. No longer is investigative and therapeutic procedure devious and subtle. We have come to the age of heroics in the application of knowledge. With the organism becoming more familiar to us and more knowledgeable through technical advancement, we can and do attack it frontally.

Hypnoanalysis is a radically abbreviated form of deep psychotherapy which takes its departure from psychoanalysis but which, at least to the moment of this writing, confirms rather than disputes the findings of the more orthodox analytical approach. Its roots are in a past that is heavy with tragic history. While the technique in itself, as it has grown under the careful and inquiring hands of latter-day investigators, is approaching methodological formulation and

theoretical maturity, it is still in process of growth. To be able to view it in proper perspective and to weigh its potentialities, something of its antecedents must be surveyed.

As an adjuvant to therapy, hypnosis has commanded the attention if not the respect of the biological arts and sciences since past ages. It was known to and practiced by Babylonian soothsayers, Egyptian wizards, Hebrew physicians, and more than likely the predecessors of these as well. As the philosophical and religious preferences of its practitioners differ from place to place and time to time, so did the various views of its nature and functions alter. At times it was regarded as a unique and special attribute of particular persons, a divinely-granted and sanctioned power or gift: at other times it was held to be an instrument of dark powers and a force for evil. It is impossible to date the awakening of scientific interest in hypnosis, although the literature suggests alchemical concern with it during the so-called middle ages. At any rate, a resurgence of popular interest came in the middle and late 18th century with the widespread application of "animal-magnetism" for curative purposes by the flamboyant Mesmer. This extravagant personality forced attention to the phenomenon, and were it not for his personal noxiousness and his great talent for alienating his colleagues by his excesses, it might have taken its place among respectable methods of treatment. Instead, by virtual decree of the French Academy of Sciences, it was banished and proscribed. Utilized in secret only by the more rash and radical spirits, it came to be regarded more as a device for entertainment and mystification, and for many years its therapeutic possibilities were neglected. Most psychologists are familiar with the recent citation of hypnosis as an aid to therapy in the latter part of the 19th century, and know the fascinating story of its recall from limbo by James Braid, the struggle between Charcot and his physicalists of the Salpêtrière and Liebau and

Bernheim of the Nancy suggestionists. Suffice to recall that, in general, the basic propositions of the Nancy group prevailed and that Freud, who although he was a student of Charcot, incorporated this view into his early therapeutic work.

The abandonment of hypnosis in deep therapy by Freud and his followers had unfortunate consequences for the development of an instrument of treatment which was later to become hypnoanalysis. It again permitted hypnosis to sink into a tradition of disrepute; but more important, it prejudiced against it the very workers whom it needed for its theoretical and practical development. The psychoanalysts were possessed of a comprehensive and dynamic psychopathological framework for it, but they summarily dismissed it from their total referential pattern, except for (curiously enough) Freud himself—who devoted considerable study to hypnosis and even centralized it in his work in group psychology—and, later, E. Simmel. That it retained its attractiveness, however, is testified by the concern it commanded during and after the First World War and through the years to the present by such analysts and analytically oriented investigators as Anna Freud, Ferenczi, Jones, Schilder and many others. It seems, somehow, that in spite of the orthodox injunction against it, the potential utility of hypnosis in explorative and depth psychotherapy was recognized.

Hypnotherapy, as Brenman and Gill have demonstrated in their brilliantly executed monograph, is a generic term covering the application of hypnosis in psychotherapeutics. These authors make out six ways in which this is done. They are: (1) Prolonged hypnosis without direct suggestion or exploration; (2) Direct suggestion of symptom-disappearance; (3) Direct suggestion of disappearance of attitudes underlying symptoms; (4) Abreaction of traumatic experience; (5) The use of specialized hypnotic techniques; and (6) Hypnoanalysis. It is with the latter that we shall here be concerned.

Hypnoanalysis is a term properly reserved for those therapeutic efforts in which hypnosis is combined with the techniques of psychoanalysis in service of the goals of treatment. That is to say, the propositions basic to hypnoanalysis are derived from dynamic depth psychology, and the methodological approach incorporates hypnosis. The exact ingredients of this combination

depend upon the variant of hypnoanalysis employed. The one which will concern us here is the variant this writer has shared in developing, but the aims of all forms of hypnoanalysis are similar. They are: (a) to seek out the hidden pathogenic agents; (b) to realize an abreaction in which the total personality shares; and (c) to more hygienically redistribute the energies formerly exploited by the pathological processes.

In the variant of hypnoanalysis with which the author is best acquainted, intensive training in hypnosis marks the opening phase of treatment. Patients are instructed in hypnosis, their misconceptions regarding it are dispelled, they are literally *taught* how to be hypnotized. Alternate methods for the induction of the trance state are utilized, depending upon the peculiar problem brought to analysis, the special character of the patient, and his condition. A general rule is that which bids the clinician to exploit existing physiological trends which are apparent to him from his clinical intuition and experience. The extent of the period of training is approximately one week. During the daily session, the special problem or perplexity which encouraged the patient to seek help is not discussed. At the end of this initial period, the patient should possess three capabilities which are necessary to the progress of the analysis: he should be able to enter the trance state immediately upon the suggestion of the hypnoanalyst; he should be able to carry out post-hypnotic suggestions with ease and rapidity; he should be able to revert memorially to former scenes and places. This latter capability presents a delicate problem, calling for the exercise of considerable care. The clinician must encourage two varieties of memorial reversion: the *regressive*—where the patient recalls previous experiences but views them in the light of his present outlook—and the *revivified*—where the patient actually relives the event by returning to the previous biographical setting and literally participating in it once more.

The second phase of therapy utilizes the method of free-association. The patient is directed to choose a starting point and to associate without regard to form or content. The usual psychoanalytic principles are followed as hour succeeds hour. When resistances are encountered, however, free-association is abandoned for hypnotic recall. Resistances are not analyzed, but rather undercut. The patient is hypnotized and

urged to reveal the nature of the matter to which he has demonstrated reluctance. If the matter is biographical, either regression or revivification may be employed, although it appears preferable to call upon the former in early phases of treatment and the latter later on. The so-called *interim phenomenon* enters at this point. Research has revealed that an unvarying sequence of events transpire when hypnotic recall is performed in the course of an hypnoanalysis: (1) resistance to free-association is present; (2) the patient recounts or reenacts the crucial material, be it event or phantasy; (3) soon thereafter the same material to which resistance had formerly been shown, if it is memorially valid, appears in the waking state in free-association. What apparently takes place to account for this important phenomenon is that the process of revelation under hypnosis exerts an effect upon the conscious ego, readying it in the interim for the often uncomfortable and unwelcome disclosures which have been made already under trance conditions. This single feature of hypnoanalysis makes the analysis of resistances superfluous, and permits the clinician to come to grips with crucial matters affecting the patient.

Now as the repressed and deflected come to light both in the waking state and in the trance, the therapist can validate the contents of the analysis, can fill in the gaps, and manipulate the analysis so that he is assured of the import and scope of each item. This he can do, if it is necessary, by viewing the material in both situations, and so obtaining a better and well-rounded picture of the problem at hand. He can and must also assure that the entire personality shares in the abreactive process. It is a cardinal principle of hypnoanalysis that abreaction take place in the waking state so that the entire functioning organism will share in the established therapeutic benefit of this process. Under regression and revivification there will appear crucial and dramatic events of biography which are of pathogenic significance. Until the fully integrated organism participates in these, hope of success in therapy is forlorn. As a matter of fact, unless this is accomplished, the essence of hypnoanalysis is lost, and all the negative criticisms which apply to the superficial suggestive therapies will be in order.

Yet another feature of technique for the middle phase must be mentioned. It has been found

that often the waking organism is unprepared for the acceptance of material which has been revealed under hypnosis. Because of this, it becomes necessary to follow each episode of trance with post-hypnotic amnesia for the contents of the trance, thus permitting the interim phenomenon to accomplish the ego-preparing work of paving the way for a routine acceptance of such items.

The final phase of therapy is entered upon when it becomes clear that all the factors accounting for the therapeutic problem have been exposed, reacted to, and examined. The transference relationship which has, during the hypnoanalysis to this point, been exploited for continuity of treatment, now becomes the central agent for bringing it to a close. In essence, this final phase is synthesizing and educational. From the exploration of the total organism there will have appeared varied pathology of ideas, goals, and attitudes which have originated in misconceptions, misinterpretations, and from the employment of the various mechanisms of defense. The hypnoanalyst now has as his task to reeducate his patient in respect of all of this, and to exert toward the reorientation of the personality along more hygienic lines. Herein the usual techniques of psychoanalysis are employed, but these are re-inforced by post-hypnotic suggestion. More than mere verbal acceptance of the new goals, attitudes, style of life, ways of regarding the past are required by hypnoanalysis. These must literally be incorporated into the performing organism and be shared by it in all the levels and segments of the personality. What is called for is a real engrafting process. At last, the transference relationship is dissolved. This is accomplished by redistributing its energies along the lines indicated by the therapeutic course. Here, again, hypnosis is drawn upon as an agent of enforcement to exert an effect upon those components of the organism not otherwise accessible.

The problem of the operationally effective field for hypnoanalysis has been under examination by this investigator and others during the past few years. At the present writing, it appears that the technique is applicable in every instance where a dynamic investigation of the personality is wanted, and to the treatment of such psychogenic disorders and aberrations in which there is presented to therapy a relatively intact ego. The limitation regarding the intact ego

may possibly not hold; yet the present writer has encountered serious difficulties where this caution has been violated, and believes the matter is still in a research stage. The categories to which hypnoanalysis has been applied with success by the author and others are as follows: hysterical somnambulism, anxiety neurosis, homosexuality, alcoholism, kleptomania, schizoid personality, symptomatic asthma, frigidity, adult maladjustment, conversion hysteria, psychopathic personality, problems in adaptation, and pre-psychotic personality types. To this list, workers at the Menninger Clinic add anxiety hysteria, hysterical psychosis, neurotic depression, and psychogenic reaction to pregnancy.

Hypnoanalysis has many advantages. It is rapid and effective, and appears to be widely applicable. On the other hand, it requires a high degree of training in the clinicians who employ it, calling for a basic knowledge of psychodynamics, psychopathology, and psychotherapy. Furthermore, it makes special demands upon the therapist due to the peculiar inter-personal relationship that obtains between hypnoanalyst and patient. This relationship transcends even the close transference situation obtaining in psychoanalysis. The setting of the treatment provides, at times, a prone, pliable, and trusting subject who can be used by the therapist as an object and target for his own frustrations and hostilities. It demands, therefore, that the therapist have himself well in hand if he is to operate with the requisite scientific circumspection as an hypnoanalyst.

There is no question but that hypnoanalysis offers a fertile therapeutic and research field. It is the youngest of psychotherapeutic forms, and on the basis of performance to this date seems promising. In summary, it is a method which, to quote a previous report of this writer, "aligns itself with psychoanalysis as a form of therapy

which aims at routing out from the deeper levels of the personality the specific agents responsible for the observable pathology. It operates to expose the basal mechanisms and processes on which depends the pathological process clinically visible or at least reportable as aberrative behavior, psychogenic disorder and malfunctioning, and maladjustment. Under its methodological terms, it circumvents or disposes of the objections classically leveled against the use of hypnosis in therapy. It guarantees the participation in abreaction of the total personality; it deals with the basic sources of conflict rather than symptoms; it exploits the transference relationship; it establishes therapeutic controls and safeguards; and it enables continued validation of analytical material. . . . It is a radically abbreviated form of dynamic psychotherapy, the operational field of which has been defined as (at present) extending to cases wherein a relatively intact ego is presented to therapy. The method makes special demands upon the clinician, relating to his observance of certain operational rules and to his self-knowledge. It is, in short, another weapon in our relentless and unremitting fight to free mankind from those ills and perplexities which blight his existence and shorten his days."

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I

INDIVIDUAL DIFFERENCES. — That differences exist among human beings has long been recognized, but not until people were subjected to quantitative measurement was the fact experimentally established that every individual is unique. While most characteristics are common to all people, each person has a different degree and a different combination of these characteristics. Individuals differ widely in physique and general appearance; in all their abilities, whether general intelligence or special aptitudes, such as motor ability, music and art; in their interests and desires, their moral standards, and in their ability to withstand thwarting of their emotions.

Marked individual differences are as common in infra-human as in the human species. Experimental studies of monkeys, apes, rats, and guinea pigs, have indicated wide variation within each species in learning and problem solving ability, in social domination and in neurotic behavior. Pronounced variations in structure and function have been found within all levels of organisms throughout the phylogenetic scale. Among animals of different species variation in the rate of learning is more definite than among different animals within any given species because of the wide diversity in neural and bodily structure. Variations in temperament and in physical structure also affect the performance of any animal. Differences in capacity for education and vocational success are dependent upon such variations.

Definitions of intelligence and other aspects of personality differ, and there are difficulties inherent in the tests and other measuring instruments used, nevertheless, knowledge of human variability has steadily increased in range, detail, and accuracy. Standardized tests and other techniques now provide fairly reliable methods for determining the kind and degree of individual variation in many traits. These techniques which psychologists have devised have shown that no two people are alike in any traits studied. Ability to understand human be-

havior rests largely upon recognition and understanding of individual differences.

Historical Background. Through keen observation and logical techniques, the ancient Greek philosophers accumulated facts on human variation. Clear evidence of the early recognition of such differences may be found in the Republic of Plato. He states: "No two persons are born exactly alike, but each differs from each in natural endowments, one being suited for one occupation and another for another." Plato believed every individual should perform those tasks for which he is best qualified by nature, whether labor, business, the army, or the administration and government of the state. He advocated little training for the laboring groups because they were poorly endowed and did not warrant the expenditure. For the mentally superior, on the other hand, he advocated prolonged and intensive intellectual training to prepare them as rulers of the state.

Aristotle, too, recognized that individual differences exist, but he devoted far less space in his writings to a discussion of human variations. In contrast to Plato's hereditary caste system of education, Aristotle stressed the differential effects of education on individuals of varying abilities. He stated that the possibilities of change within a given person are limited. He recognized clearly that some persons have superior endowments while others may be handicapped at birth.

Throughout the Middle Ages, individual differences were largely ignored, since institutional Christianity placed its emphasis on spiritual equality. This almost complete neglect of human variations continued through the eighteenth and into the nineteenth century, until Rousseau, Pestalozzi, Herbart, and Froebel pleaded for recognition of the educational needs of the individual child.

Up to and throughout most of the nineteenth century, all principles of human variability were derived from crude observation alone. Until that time, no techniques for systematic and experi-

mental studies of individuals had been developed. The earliest systematic measurements of individual variation were made by astronomers who compiled records of observers, noting differences in the estimates of two or more observers and also in any given observer from time to time. Such studies came to be known as measures of the "personal equation" of different individuals. However, the study of individual differences really grew out of experimentation which had for its aim the discovery of general principles concerning human behavior. Many of the personal variations which occurred in the early stages of this experimental work were ignored or regarded as errors. As the experimentation progressed psychologists recognized that these variations were real and were deserving of special study.

The pioneer in extensive systematic and statistical investigations of individual and group differences was Sir Francis Galton, who initiated the "eugenics" movement, and who more than anyone else may be considered the founder of the science of individual differences. He stimulated interest in many studies in the field of human variation, and devised tests for the measurement of differences in discrimination of weight and auditory acuity. He also developed statistical techniques for the analysis of such data, and studied aspects of personality, such as character, by empirical methods. As early as 1884, he established a laboratory wherein mental and physical tests—largely sensory and motor—could be taken for a small fee. He was a pioneer in the use of the rating scale and questionnaire methods widely used today in studying personality differences.

Inspired by the work of Galton James McKeen Cattell and Joseph Jastrow in America devised tests for measuring the relatively simple sensory, motor and perceptual abilities. These tests were used with a large number of subjects over a period of many years, and the results compiled and analyzed statistically. From the outset of his career Cattell was impressed with the variability of human performance, and the need for prolonged and careful observations in order to arrive at reliable results. He was one of the earliest psychologists to introduce quantitative methods for the measurement of individual differences.

The trend of the growing movement was changed by Alfred Binet, the great French psy-

chologist. He stressed the importance of measuring the complex, higher mental processes rather than simple sensory and motor abilities, since differences are more marked in the former. Binet realized that the higher mental processes could not be measured as precisely as the simpler sensory-motor abilities, yet he was willing to sacrifice the greater degree of precision to secure some measure of these more complex faculties. He also increased the number of different functions measured, hoping thus to secure a measure of general mental ability. The Binet scales involve the fundamental ideas underlying all tests of mental ability and some aspects of personality widely used today.

Many revisions of the Binet scale have been made. Of these, the most widely used have been the Stanford Revisions by L. M. Terman in 1916, and in 1937. A number of modifications and improvements were included in the Stanford-Binet Scales. The number of tests was increased to cover a wider range of abilities, and there was improved standardization of the methods for giving and scoring the tests. Terman also divided the mental age by the chronological age to express the relationship between the two ages. The resulting value was called the intelligence quotient, or I.Q. This quotient has been found to remain fairly constant within certain limits.

With the Binet technique only one subject could be tested at a time. This led to a further modification in the development of group intelligence scales. The First World War, with its pressing need for securing a rough classification of thousands of men in a brief period, stimulated the preparation of a test for measuring the general mental level of large groups of men at the same time. This task was entrusted to a committee of five psychologists who were trained in the field of mental testing. The committee was under the direction of Robert M. Yerkes. The nature and range of the items included in the test, the relative objectivity in administering and scoring it, together with certain other definite requirements which were met as far as possible by the committee resulted in a fairly reliable and valid instrument which has served as a model for later tests. Since 1920 group tests have been devised for age levels ranging from the kindergarten to the university, and to meet the needs of a wide variety of special groups. Many of these tests have been

carefully standardized and pronounced improvement in reliability and validity has been made.

Classified according to their uses, four main kinds of mental tests have been developed: Achievement Tests, Aptitude Tests, Intelligence Tests, and Personality Tests. Some of these tests have been devised as individual scales, others as group scales. Achievement Tests are designed to measure skills and information which have been learned. They measure present ability. Tests designed to predict later success in some given field, such as artistic, clerical, language, mechanical, and musical aptitudes are termed Aptitude Tests. Intelligence Tests are tests of psychological processes. They diagnose behavior. They are used primarily to determine the strength, precision, or effectiveness of the operation of any mental activity. Some intelligence tests are designed to give a measure of general mental ability, while others are limited to some particular ability, such as verbal, performance, mechanical and motor tests. Personality Tests are tests designed to measure the more general traits of personality. They include rating scales, questionnaires, and projective techniques, as well as certain tests for determining differences in social and emotional traits, and other aspects of personality. Most of the findings in the field of human variation are based on results obtained by means of such measuring devices.

✓ *Significance of Individual Differences.* In a society founded on principles of equality and in which, in theory at least, institutions have been established to foster equal opportunities for all individuals regardless of age, sex, race, religion, economic or social status people have been loath to recognize and accept the fact that marked differences exist among their fellow beings. Yet these differences present problems which have baffled our keenest thinkers since ancient times and are of greatest significance in modern society. Human variation has made laws and government necessary and has been responsible for the development of educational, religious, and political institutions. Failure to recognize individual differences has resulted in religious, economic and social turmoil and has precipitated countless wars throughout the history of the world.

People are not born equal nor can any amount of training or any kind of environment be provided which will make them so. Both

training and environment tend to accentuate differences quite as much as they foster similarities. Biological factors, too, are responsible for variation between different species and within any given species. Social life is much more interesting and has far more spice because individuals vary widely. While scientists are unable to give a completely satisfactory explanation of individual differences, the facts that have been established are instructive. They indicate that variations have a certain regularity and tend to follow certain laws.

Present-day studies of intelligence and learning have demonstrated marked diversity in capacity for education among different individuals. No educational system can be successful unless adequate provision for these differences is made in both subject matter and methods. An educational system organized and administered on the assumption that all individuals are equal cannot be efficient. However, pupils do not fall into easily distinguished and fixed categories to aid the schools in differentiating instruction. In most all traits, they vary by insensible degrees and within widely separated extremes. These facts present countless administrative and instructional difficulties to educators. Nevertheless, differentiated educational procedures are imperative if due recognition is given to the unique potentialities of each child.

In business, also, careful study must be made to adjust men and jobs if waste of human energy and materials are to be avoided. For most satisfactory results, men should be placed in jobs for which they are suited by intelligence, interest and aptitude. Business men have invested enormous sums in perfecting machinery and methods of accounting and salesmanship only to lose larger amounts by their unwise selection of men to operate the machines effectively. Employment psychology is based on the assumption that men show wide variation in specific capacities and skills due to environmental influences, including training, and hereditary constitution. Employing men of superior intelligence in unskilled labor results in industrial unrest. Interest is a major factor accounting for the notable difference in level of attainment between men and women in business and industry. Many women expect their employment to be temporary, and as a result, are uninterested workers, while most men plan to remain in their chosen vocations. They take their work

more seriously and usually become interested in it.

Government and military leadership, too, usually has been in the hands of a limited class of men. Among primitive peoples, physical strength and prowess are the chief basis of civil and military leadership, while among more highly civilized peoples mental and moral qualities receive greater emphasis. In all cases, however, leadership has been in the hands of individuals who are superior to the masses in some respects.

Individual differences are a potent factor resulting in widely divergent views characteristic of political parties and countless political and governmental policies. In consequence some individuals or groups are violently for and others no less violently against particular issues. Laws are passed to please noisy minorities while the silent majority is opposed to the law with resulting conflict between law and social reality.

Human beings differ greatly in the fundamental, biological requirements of food, exercise and sleep. What is suited to one person may be detrimental to another. Drugs do not affect all alike, and susceptibility to fatigue varies widely.

Wars disclose marked variations in the ability of men to withstand frustration and privation. The resiliency of the human organism is noteworthy. Human beings can tolerate an enormous amount of strain without loss of sanity, but here also great diversity has been noted. Some people have been known to withstand very critical and trying crises only to develop greater poise, while others show marked mental disturbance in far less difficult situations. There is little in the life of human beings that is not influenced directly or indirectly by individual variations.

Nature and Extent of Differences. Most human variations are a matter of degree not of kind. They are quantitative rather than qualitative, although qualitative distinctions based on socially-determined criteria are frequently made, as when we speak of a pleasing voice, a wholesome personality, or good moral standards.

Scientific findings with regard to individual differences are often at variance with popular conceptions of the nature and extent of them. The "type" theory has been commonly accepted as descriptive of differences in physique, mentality, and other aspects of personality, since it simplifies the problem and serves as a short-cut

in understanding human nature. People are classified as tall or short, bright or dull, good or bad. Each classification involves sharply contrasted opposites, easily construed as antithetical, dichotomous categories. The typologists assume the facts of human nature to be discontinuous in distribution; each separate case is pigeonholed as of a given type. A compartment scheme of two, seldom more or less, distinct types would suffice for most human characteristics that are discontinuous, as, e.g., the number of hands or ears. Most aspects of human nature cannot be described as all or none, this or that.

The dichotomous division of continuous traits doubtlessly resulted from the ease in differentiating the extremes in many traits. While it is easy to differentiate giants from dwarfs, or geniuses from idiots, it is often extremely difficult to discriminate slight degrees of variation in both height and intelligence. Some psychologists have contributed to the fallacious dichotomous grouping by placing undue emphasis on extremes of personality, e.g., as when they divide persons into introverts and extroverts, ascendants and submissives, or into verbal and mechanical types. A recent attempt to divide personalities into definite dichotomies is Kretschmer's physical types, the pyknic and the asthenic, each physical group with its own exclusive psychological characteristics. Spranger attempted to classify people into six types which were said to be fundamental and largely predetermined in human nature. These six so-called natural and pure types are the economic, the esthetic, the political, the religious, the social, and the theoretic. However, perhaps no one ever represents a strictly pure type. Spranger's type classification does not have a physical basis, and it was not founded on clinical or experimental study. It was abstracted from the study of history and literature. While interesting, there is little of value in such attempts since they do not conform to experimental findings.

Most human variations are not discontinuous and qualitative, but continuous and quantitative. If grouped in class intervals, they follow a normal bell-shaped curve of distribution known as a frequency polygon or curve. The majority of cases cluster about the midpoint of the curve with a continuous gradation from one extreme to the other with no gaps or breaks in the curve. It is uni-modal rather than bi-modal, tri-modal, or multi-modal, as affirmed by vari-

ous type theories. The curve also is bilaterally symmetrical, with approximately equal numbers falling on either side of the perpendicular erected at the center of the horizontal base line.

Under special environmental conditions, it is conceivable that two groups with little overlapping of certain traits might result. This might be the case in cultures fostering two extremes of social attitudes, linguistic abilities, dietary habits, or educational environments of widely varying degrees of richness. Such conditions and comparisons, however, are the exception rather than the rule. They tend to bring the abnormal into sharp relief by contrasting the two extremes rather than delineating the range of human diversity.

The extent to which intelligence varies is now measurable by statistical methods. Not only has proof been given of variability, but also approximate numerical equivalents of various degrees of normal and abnormal capacities now are available. If measurements are made of the ability of a large random sampling of the population to achieve on any given task or tasks and the results properly tabulated, the scores will be distributed along a normal frequency curve. A few persons will show low achievement, with the number increasing gradually until the midpoint of the curve is reached. Thence, the number will steadily decrease until the opposite extreme is reached, at which point a few persons will exhibit exceptional accomplishment.

If the data compiled are derived from the measures of a single task, the resulting curve illustrates the distribution of a special ability. In forming our present concept of general intelligence, samples of various kinds of ability are taken. If all scores for any given individual fall near the norm or midpoint of a large random sampling of persons of like age and sex, we may conclude the individual measured is an average or typical person. If he should fall decidedly above or below the norm for his group, he is considered superior or inferior, respectively, in the abilities measured. A third individual may show a wide diversity of scores in the various abilities measured. Such a person is said to be uneven, and is often unpredictable, in his capacities.

The principle of deviation is clear, though just how far one may deviate above or below the norm before he is designated abnormal is largely a matter of arbitrary definition. Data for

intelligence ratings, metabolic rate and glandular function of a large unselected sampling tend to follow the normal curve, with the majority of persons rating average. The points above and below which individuals are considered abnormal are fairly well defined for these traits or conditions. Normal intelligence is commonly designated in terms of the intelligence quotient. A person whose intelligence quotient falls below 70 is considered mentally deficient, while one with an I.Q. above 130 is designated very superior. Likewise, most people have metabolic rates near the basic or average point of zero. A deviation above plus ten or below minus ten is considered abnormal. However, there is no general agreement how far one may deviate from the normal on such traits as aggression or submission, introversion or extroversion, or nervous stability and instability, before he is designated abnormal.

In some traits the degree of variability is relative to a given culture or norm. The statistical norm is not relevant to all types of data nor from all points of view. People with some degree of drug addiction, syphilis, brain tumor or cancer, are deemed abnormal by most Occidental social groups. The presence of a causal agent producing mental disturbance in any degree is considered abnormal in many cultures. Moral and ethical standards, likewise differ for different cultural and religious groups, especially the latter.

Factors Influencing Variation. Understanding and control of human behavior must be based on knowledge of the factors which determine variation. Why individuals differ from one another has been a moot question down through the centuries and has led to lively controversy.

The two main sources of individual differences are hereditary background and environmental influences affecting development. Nature-nurture discussions have attracted wide interest and stimulated a broad range of studies. Galton's research which stressed the importance of inheritance in accounting for differences in natural abilities served as an impetus to other workers. Experimental materials and data compiled by biologists and psychologists have contributed to an understanding of the two sources of human diversities, and have afforded a basis for educational philosophy and method.

Not only do both heredity and environment influence human traits, they also mutually affect

one another. It is impossible to differentiate human attributes as those resulting solely from heredity and those attributed entirely to environmental influences. The problem thus is one of determining the relative contribution of each. To what extent are traits and activities determined by hereditary conditions, and to what degree are they conditioned by environmental factors? While these two influences never operate independently in determining human development, it will simplify the discussion to indicate the manner in which each affects organic structures and their functions.

Heredity. The sciences of genetics, especially the gene theory of inheritance, has contributed greatly to an understanding of heredity. A human organism originates in the union of two germ cells, one from each parent. These two parent cells contain many distinct and diverse substances, called genes, which are now believed to be the biological determiners of human variations. There are hundreds of thousands of genes in each germ or parent cell and, with the exception of identical twins, no two individuals have identical sets of genes. Individual parents do not produce germplasm. It is continuous from generation to generation, and is transmitted through parents to their offspring. The child inherits genes not only from his parents but from all of his direct ancestors. This continuity of genes through many generations, the very large number of genes in each germ cell, and the enormous variety of possible gene combinations in the complex human organism, explain the great diversity in individual offspring and also why no child ever is exactly like either parent.

Yet only the structure of the organism is determined by hereditary factors. Apart from their dependence upon certain inherited structures, activities and functions are not innately determined. These facts discredit the theory of the inheritance of acquired characteristics. No plausible explanation has been made which would indicate how the abilities or the knowledge acquired by either parent could bring about a change in his germplasm and thus be transmitted to his offspring. The presence of any given structure does not of itself insure the development of any particular kind of behavior, although the absence of the necessary structure will prevent its appearance. The nature and degree of development of various structures and

of the total organism will affect their functioning.

The earliest systematic investigations of the influence of heredity were made by Francis Galton and reported in his *Hereditary Genius* in 1869. He used the family history method and the correlational method, two methods widely used today, in studying the careers of the relatives of almost a thousand eminent men. He found these men to have relatives of a similar degree of eminence in numbers far greater than chance would allow for average men. In fact, he found the probability of an eminent man having an eminent male relative to be more than one hundred and thirty times greater than for ordinary men. In light of this finding Galton concluded that human abilities are inherited. However, he did not deny the influence of environment and training, and he admitted that nature and nurture cannot be isolated from one another and assigned definite values.

Later studies have shown higher correlation between physical and mental traits of identical twins than for fraternal (non-identical) twins. These data substantiate further the belief in the potency of inheritance in determining the characteristics of an individual, since identical twins develop from a single fertilized ovum whereas fraternal twins result from the simultaneous development of two different cells.

From the standpoint of heredity, the similarity between non-identical twins is no greater than for ordinary siblings, and yet the average coefficient of correlation between the measures of most traits is considerably higher for non-identical twins (+.70) than for ordinary siblings (+.50). If the traits correlated were wholly a matter of genetic determination, the correlations between non-identical twins should be no higher than between siblings. Hence differences between these two groups, would seem to be the result of greater similarity in environmental influences, the prenatal fully as much or more than the postnatal influences. This fact also corroborates the belief in the complexity of the nature-nurture controversy and the futility of attempting to disentangle the specific contributions of heredity and of environment to achievement.

Environment. The effect of environmental conditions in accounting for individual differences may be considered from two points of view: first, the period of development, whether

during the prenatal or during the postnatal period; and second, how it affects the organism, whether directly as by injury to a certain structure, or indirectly, as by barrenness of surroundings.

The organism is most modifiable during the early stages of the prenatal period. Consequently, the environmental influences which operate on the organism at this earliest and least developed stage have marked and lasting effects on its later growth. Since the embryo receives its nourishment from the blood stream of the mother, any conditions which affect the chemical condition of the mother's blood influence the structural development of her offspring. Lack of adequate nutrition for the mother, indeed any nutritional imbalance arising in her from whatever cause, may have some effect on the developing embryo. Normal growth of the embryo may also be disrupted by bacterial infection, toxins or mechanical injury. Serious injury to the mother may injure the child, not infrequently resulting in serious handicaps after birth.

Extreme structural changes resulting in monstrosities with two heads, one or many eyes, limbs, et cetera, have been produced experimentally in lower animals by introducing drastic changes in temperature and nutrition and by the use of physical and chemical agents in the early stages of development. Experimental studies indicate that the fetus responds to certain stimuli, and may be conditioned to changes in pressure and temperature.

The advent of birth makes a sudden and drastic change in the environment to which the neonate must adjust. The physiological adjustments required of the infant are complicated. New functions such as breathing, eating and digesting must quickly be established. There are pronounced temperature changes, and the neonate assumes new postures. All of these factors necessitate countless variations in both structure and function on the part of the newborn infant.

Of all the postnatal, environmental conditions that influence the development of a child, the home is the most determinative. The school, church, friends and various social groups exert increased influence upon the child as he matures. These influences add an enormous number of new variables in determining individual differences. The economic status of the family, the attitudes and compatibility of parents, posi-

tion in the family, sibling relationship, degree of protection and security are but a few of the host of variables found in the environment of the home.

Moreover, differences in school environments are fully as great as are those found in homes. The physical environment of the school frequently is such that it fails to create the receptive frame of mind essential for effective learning. It may arouse a permanent antagonism to all activities associated with school life. Even more influential in their effect on the child are the pupil-teacher and the pupil-pupil relationships. An able, well-balanced, sympathetic, understanding teacher can do much to overcome limitations in school equipment and physical surroundings.

Recent studies of the "wolf-girls" of India, of orphanage, canal-boat, and gypsy children have provided revealing findings on the effect of home, school, and other social influences on the physical, mental, emotional, educational and social development of children. While certain forms of behavior are dependent on structural development and general maturation, the above and similar studies have shown that many abnormalities and deficiencies are directly traceable to environmental influences. The environment of early childhood is highly significant for normal development. No amount of training or advantages in later life can make up for deficiencies during the early preschool years. Nevertheless, all available studies indicate that heredity sets certain limitations on both structure and function on which no environmental influences, however great, have any effect. That heredity is a more potent factor than environment in determining mental level as measured by intelligence tests has been demonstrated in a number of cases of identical twins who were separated at an early age and later lived in widely different environments. The average differences in intelligence quotients varied only a few points from the average difference of I.Q.'s for identical twins who were reared together. Children from orphanages and inferior homes adopted into superior homes in infancy show some increase in I.Q. but the average mental level of such foster children never reaches the level of the own children of the parents in the superior homes. Hence it would seem that the level of heredity is influential in determining both the economic and cultural status of the home as

well as the level of mentality of parents and their offspring.

Differential Factors. The various factors that influence human variation may be conceived as the joint product of heredity and environment, or nature and nurture. Such biological factors as age, sex, and race as well as family background may be attributed to heredity, while the cultural, educational and social agencies which mold the individual's development from birth to death are environmental influences. These factors will be considered in turn, and the differential aspects of each briefly analyzed.

Age. Not only are individual differences found in human infants at birth, but these differences become more pronounced as the child matures. Marked variations in size and weight, as well as in contour and proportion of body structures may be noted. Growth is very rapid during the first few years, even though not all aspects of growth occur at the same rate. Growth in height is more rapid than growth in weight and breadth. The weight at birth is doubled during the first six months and trebled during the first year after which the curve of weight continues to show definite negative acceleration.

Vital organs such as the liver, lungs, kidneys, heart, and brain grow at different rates—most of them showing a period of acceleration followed by periods of retardation. The nervous system, especially the brain, develops most rapidly during the prenatal period. At birth the head is relatively the largest part of the body and is the first bodily structure to attain mature size. Such changes are due primarily to maturation—the growth and development of innate characteristics.

Numerous studies have shown a striking regularity and orderliness in the development of behavior patterns during the early weeks of life. While specific behavior patterns develop uniformly during this period, pronounced individual variation in the time of their appearance has been noted in different children. Certain basic uniformities in development occur in all infants, whether normal or abnormal, superior or inferior, even though the growth curves disclose individual variations to be relative from the early months of life throughout the early years of childhood.

Variation in the mentality of children has long been recognized, but only in recent years

have standardized scales been devised to measure mental growth changes. The scales are designed to give a quantitative statement of increased mental ability, and the results are used as a basis for predicting the future development of the subjects tested. The intelligence quotients of most children tend to be relatively constant, but the maintenance of relative rank among children, while marked, is not universal. Nevertheless, it is significant from the standpoint of education that each child tends to maintain his relative position of inferiority, mediocrity or superiority in general mental ability.

Most traits of a given individual show positive correlation, even though sometimes the correlations are low. Linguistic and mathematical abilities usually correlate most highly with general intellectual level, while art and musical aptitudes exhibit the lowest correlation.

Mental growth, like physical growth, is not symmetrical; it varies in rate at different ages. Most studies show a continuous increase in mental capacity through adolescence, at least to the age of twenty or beyond. There is considerable evidence to indicate that inferior individuals for the most part tend to mature earlier than normal ones, while superior persons probably mature later, though exceptions have been found. Some time after the age of twenty a slow decline in intellectual capacity usually sets in, becoming marked after fifty. Here again individual variations are pronounced.

Emotional growth and the development of character traits are other aspects of personality which manifest marked diversity. Their rate of growth and level at maturity will often exhibit little or no correlation with maturation in general intellectual capacity or with educational achievement. Character development is a slow process and continues well into adulthood. It tends to be more modifiable than physical maturation and level of mental capacity, and individual variations are very great at all ages.

Sex. The problem of sex differences has attracted perennial and widespread interest. A vast amount of literature on the subject has been published. The inferiority of the female is a popular belief universally accepted since ancient times. Discriminations on the basis of sex have been prevalent in all races in educational and vocational opportunities and are not uncommon even at the present time. Specialization and division of labor are characteristic of

all cultural groups. The particular duties assigned to each sex differ widely in various groups and not infrequently are reversed in varying cultures. The common belief in hereditary sex differences, particularly in mental and emotional traits, and the necessity for assigning special roles and tasks to each sex, is centuries old. To attempt to train women to the level of achievement attained by men has been considered futile. That existing sex differences may result from restrictions imposed upon women from infancy, especially in the educational and vocational opportunities open to them, has been overlooked.

Most scientific studies relating to sex differences agree on certain important findings. Although boys are taller and heavier at birth and at adulthood than girls, girls mature earlier than boys, anatomically, physiologically and mentally. In the early years of adolescence, girls are taller and heavier than boys. In girls the trunk is relatively longer and the limbs relatively shorter than in boys. Girls tend to have a greater amount of fat while boys have more muscle. They reach puberty at least a year or two earlier than boys. Girls' bones ossify earlier, and they cut their permanent teeth earlier than do boys. The thyroid gland appears to play a more important role in girls, and thyroid disease is more common in women. The removal of the thyroid gland in lower animals has shown more pronounced effects on the development of females than on males.

The results of mental and scholastic tests indicate that mental development at least from early childhood to adolescence, also proceeds more rapidly in girls than in boys. As they approach adulthood however, the average scores on general intelligence are strikingly similar, although many studies have shown greater variability in males. A greater number of very low scores as well as a greater number of very high scores seem to be made by men than by women.

History has recorded many more outstanding men than women in practically all lines of endeavor. Men have been the leaders not only in military and political life, in business and industry, but also in science, literature, music, and art as well. In light of the social status of women in the past, it is not surprising, indeed, to be expected, that such should be the mark of differences and cultural taboos

have forced women to devote an undue amount of time to home-making and child-bearing. Men, on the other hand, were drawn into a richer and more stimulating environment, contacts which necessitated training, while women were forced to subordinate their interests and ambitions to the careers and aspirations of their husbands. Custom has barred them from competing with men. Even today women in some primitive societies live in a cultural vacuum.

Any interpretation of sex differences on the basis of test results must take into account cultural differences between the sexes and the limitations in training and opportunities for women. Many differences now found might disappear were it possible to equalize all conditions for both sexes from birth through maturity. Not all differences between the sexes listed below should be considered as innate in origin.

The distribution curves of test results for the two sexes usually are decidedly overlapping, but for some aspects of behavior consistent and reliable differences in averages have been found. Men are usually superior on tests of reaction time, speed of tapping, muscular strength, and coordination and dexterity with tools, while women excel in speed of word association, quick adaptation and shift of attention and on tests involving finger dexterity. Women appear to be somewhat superior in tests of color discrimination, and color blindness is more commonly found in men. In most other sensory capacities, sex differences are either very slight or wholly absent.

In tests on school subjects, men show consistent superiority in mathematics, science, and history, while women excel in English and reading. Men also tend to be superior in sustained logical work and spatial thinking but are definitely inferior to women in most memory and verbal tests and on tests of number-checking and pattern-recognition. Differences in memory and verbal ability favoring girls are evident in the preschool period and persist throughout life.

Race and Nationality. The measurement of group traits especially racial and nationality characteristics, presents a host of difficulties, many of which appear to be insurmountable. On superficial thought, it would seem to be a relatively simple matter to obtain a representative sampling of any given race or nationality,

for the superficial thinker accepts the popular classification of races based on skin color. Thus we have five main groups: white, yellow, red, brown, and black. From an equally superficial viewpoint one's nationality is determined by the country (geographical area or cultural or political unit rather than biological grouping) of one's birth, or at most by the birthplace or places of one or both parents or grandparents. In truth, however, the problem of defining either race or nationality becomes extremely complex and baffling. They are problems fraught with countless pitfalls. Inter-marriage between individuals of different races and nationalities and all manners of cultural intermingling which have gone on all over the world for centuries have resulted in the disappearance of most if not all pure racial and nationality groups.

To complicate further the problem of securing reliable data, race and nationality prejudices, even to point of extreme hatred, are encountered on every hand. Membership in a group confers superiority on that group. Its members are the chosen people, excelling all other groups in the many aspects of its culture. Other groups are inferior in so far as they differ—the more marked the differences, the greater the inferiority. Race prejudices have existed through the ages, especially where unlike peoples have been forced to live in close proximity to one another. Worse still, these prejudices all too often lead to violent conflicts between races and nations. The disturbed world conditions of the twentieth century, with their marked social unrest and bitter political controversies, have accentuated emotional behavior. This prejudice and the heightened emotional tension has made it extremely difficult for even the scientifically trained student to maintain a disinterested and impartial attitude and arrive at unbiased conclusions.

More difficult still is the attainment of a truly random sampling of any one race or nationality even when they are defined. To secure comparable samples of two or more such groups is even more difficult, if not indeed impossible. Many races have been studied in which the word "race" was not used in any scientific and ethnic sense. More serious, for many of the groups, the samplings have been too small to possess statistical reliability.

The selection and standardization of test

materials, the techniques for administering and scoring the tests, and the norms for interpreting the results obtained from the measurement of groups varying widely in cultural background and in opportunities and standards of training and experience, present difficulties which baffle the keenest minds.

To secure even a measure of reliability, all data on racial and national comparisons should be evaluated in the light of at least three criteria: (a) the sampling of the given population considered, (b) the conditions under which the data were collected, and, (c) analysis of the statistical methods employed in interpreting the data. In the brief summary of findings on race and nationality differences that follows results will be cited only when there is evidence that the above criteria have been conformed to as closely as possible. Since any criteria that may be used for either are at best approximate, no attempt will here be made to define either race or nationality, much less to classify them into a limited number of groups.

In analyzing the more reliable findings resulting from these studies one is impressed with (a) the wide variation within any so-called race or nationality for any trait studied, (b) the marked overlapping of any two groups on any given trait, and (c) the lack of any consistent cluster of traits which characterize any group.

A number of other fairly reliable differences disclosed by various studies merit consideration. As regards physical differences, variations in skin color are the most obvious. On the other hand, differences in facial and cranial measurements and in stature are surprisingly small for different groups. Such characteristics as shape of the skull, facial features, and stature have been found to depend to some extent on influences in early infancy, and on various later environmental conditions. Hair and eye color are also variable, but even these as well as stature may be affected by climate, disease and diet. Available evidence indicates that the average weight of the cerebrum in Whites is approximately 10 per cent heavier than in Negroes.

As regards differences in sensory as well as in the more elementary motor processes such as rate of tapping and hand steadiness, for example, no significant differences between different nationalities have been found.

Many attempts have been made to find differences between racial and nationalities.

in the higher mental processes, in light of the results obtained by intelligence tests, especially group tests of intelligence. Group tests require a high degree of cooperation and adjustment of the subjects to the examiner. Since directions must often be given to the testee through the medium of language, and sometimes even by gestures, the results obtained may be a measure of the examiner's ability to make his instructions clear quite as much as of the subject's ability to comprehend and carry out the instructions. An individual test is more satisfactory than a group test in cases where language handicaps are encountered.

Even when very carefully constructed, most tests are influenced by cultural and educational factors. Consequently, at least some of the differences found between groups may be attributed to variations in cultural level and social heritage rather than to a native inferiority. This fact has been demonstrated in studies in which comparisons were made between the intelligence of groups of American Indians and white children on the basis of tests devised by Whites and standardized on a sampling of the white population. The Indian groups, although varying from tribe to tribe, rate consistently lower than Whites on verbal tests, whereas they are but little, if at all, inferior to Whites on most performance tests when scored for errors and not for speed. The emphasis placed upon speed varies greatly in the two cultures. The Indian is handicapped when speed becomes a factor in determining the results of test scores. The inferiority of Indians on verbal tests likewise may be attributed to social heritage, since the test scores tend to increase as the cultural level and educational opportunities approximate that of the white population. An increase in intelligence test rating also has been found for mixed bloods, with a steady rise from three-quarter-bloods through half-bloods to quarter-blood Indians.

Negroes in America invariably rate lower than Whites, and Southern Negroes lower than Northern Negroes. Authorities in the field now attribute the former to superior educational and social advantages rather than to innate superiority on the part of the Whites, and the latter to the tendency for the inferior Negro to remain in the South. As in the case of the American Indian, the inferiority of the Negro is most marked on verbal tests. On some performance

tests, however, his scores approximate those of the Whites.

For the European immigrant groups a reliable difference has been found between the mean scores for the descendants from northern and southern countries, though here again there is a marked overlapping of scores. This difference, while small, favors the offspring of northern Europeans. None of these immigrant groups are comparable, nor are they a fair sampling of their native countries. Many selective factors operated to bring their ancestors to America.

Children of immigrants from China and Japan test on a par with native-born white children in the United States. Some minor differences have been noted for certain abilities, but these differences tend to disappear in the second generation of immigrants.

A careful survey of the major studies in the field seem to indicate that racial and nationality differences have been greatly overestimated. There is a wide range of ability within each group. Many Negroes and Indians surpass the average of the Whites. On the whole, it would seem that most racial and nationality differences in mental ability would be negligible or would wholly disappear were it possible to equalize educational, social and all other advantages from earliest infancy onward. A problem worthy of the most serious consideration for educators, social workers, and others concerned to promote international amity and understanding is the improvement of means for developing and utilizing the abilities latent in the underprivileged groups in our midst.

Family Background. As noted earlier, Francis Galton employed the family history method to investigate the role of heredity in determining natural abilities. He compiled data on physical measurements of parents and their children. He found an average correlation of $+0.52$ between parents and their offspring for such bodily characteristics as length of forearm and height. A similar average correlation has been found for siblings on physical traits. The correlations on these traits decrease for grandparent-grandchild and cousin relationships and increase for fraternal and identical twins. The similarity in physical traits in members of the same family results, for the most part, from their common heredity. When children selected at random are paired as siblings the average correlation for the above traits is about zero. However,

when unrelated children are paired in terms of similarity in background the average correlation is about $+0.35$. The average correlation in I.Q.'s between foster children reared in the same home, and between the foster children and the cultural status of their foster homes, are positive but low. These facts suggest that environment affects mental traits in some degree.

Thorndike has reported a correlation of $+0.60$ for siblings for scores on a battery of tests designed to measure general ability. Similar correlations have been found in other investigations. The average correlations between parents and children on most mental tests tend to be somewhat lower than for siblings. This fact would again suggest the influence of environment which is more constant as a rule for siblings than for parent and child. Correlations between siblings and even for identical twins vary widely on tests of special abilities when the ability measured depend upon environment and training. Some studies also have shown a tendency for the scores of children (both boys and girls) to correlate more highly with the score of the mother than with that of the father. Contrary to common opinion, no consistent differences have been found between the scores for parents and either like-sex or unlike-sex children. Neither daughters nor sons tend to resemble one parent more than the other.

Another physical factor that is sometimes claimed to affect the ability of the child is the age of the parents at the time when the child is born. It is commonly believed that children of young parents suffer both a physical and a mental handicap. An increase in mental rating has been found for children with increase in age of parents through the late twenties, but this increase in score tends to disappear when differences in social background are eliminated. It is evident that, in addition to inferior heredity, inferior living conditions such as inadequate nutrition, poor sanitation, fatigue, and worry during the fetal stage of development may handicap a child. Children of young parents of superior social status usually are more intelligent than are children of older parents in underprivileged groups.

The differential birth rate in families of different social status presents a serious problem for social workers. The average mental rating for children of large families has been

found to be consistently lower than for the children of small families, but, unhappily, the average mental level of the parents of large families is also lower than that of parents of small families. No reliable differences in intelligence have been found between first-born, middle and youngest children.

Ancient lore is replete with beliefs concerning astrological influences associated with the month or season of birth. Popular interest in this subject has persisted down to the present day. Perhaps for no factor in the family background here considered has more pseudoscientific information been published. Carefully controlled studies have been made in which data on the season of birth were compiled for samplings of different racial groups and the results are consistent. The findings indicate that not only are more children born during the first three months of the year due to a seasonal sex rhythm, but also that the variability in intelligence is greater during these months than for other seasons of the year. The average I.Q. for children born in January, February, and March is slightly but significantly lower than during other months. There are also more children of very superior and of very inferior mental ratings born during this three-month period. No satisfactory explanation of these facts is as yet forthcoming.

Consistently reliable differences have been found for the mental scores of children of parents at various occupational levels. The average intelligence rating of children whose parents are engaged in the professions is significantly higher than the average score for children of skilled workmen, and these in turn rate consistently higher in mentality than children of unskilled laborers. Both heredity and environmental factors enter into the determination of the mental ability of any individual. Data compiled during the first World War indicate that there is marked overlapping of intelligence scores in most vocations. Some unskilled laborers have higher mental ratings than some professional workers. Nevertheless the higher the fathers' occupational status, the higher is the average intelligence level of the children. There is a significant positive correlation between the intelligence rating of children and their fathers' vocations. The correlation, however, $+0.30$ is low. Since test results show a wide range of scores it is clear that there are pronounced

variations in ability in any vocational group. These results indicate that there is not infrequently a marked discrepancy between mental level and occupational status.

Environmental Influences. As has been emphasized throughout this discussion, environmental influences account in part for variations among individuals and groups. The importance of prenatal as well as postnatal environment has been noted. Among the latter influences that of the home, the church, the school, and various other agencies has been strongly emphasized. The specific nature of these postnatal environmental factors now calls for further elaboration. Cultural background and social heritage, when carefully analyzed, are found to influence an individual or group largely through the kind of training or education provided and encouraged by them. How early in life and over how long a period is training provided? What is the nature and extent of the educational opportunities made available and encouraged?

Early opportunity for development is particularly significant. There is an optimum period for the stimulation and exercise of innate potentialities. If suitable surroundings, stimulation and guidance are not provided during this period the probability of maximum development is slight. No amount of delayed opportunity can fully counteract the effects of impoverished or unfavorable conditions in early life. Wise guidance and training should be provided when interest in learning and creative ability first manifest themselves. Satisfactory environmental conditions are essential to the developmental process.

The differential effects of the occupational status of parents on the mentality of offspring is, in large measure, the result of educational opportunities available at different vocational levels. Low income, lack of proximity to educational advantages, and inferior standards of living incident to certain vocations drastically restrict the educational opportunities necessary for the full development of the young. Children of parents engaged in different vocations are not born equal. Some will always be handicapped, both physically and mentally, because of inadequate and unwholesome surroundings. As previously noted, the average mental level of underprivileged groups consistently has been found to be lower than the average for groups with superior educational advantages.

Educational opportunity and environmental stimulation generally are markedly dissimilar in rural and urban communities, and in small villages and metropolitan centers. The schools differ in the length of term, in the number, qualifications and specialization of teachers, in available supplies and equipment, and in the stimulation and breadth of contacts provided by wide variations in enrollment. Rural children test significantly lower than urban groups. Some investigators attribute the difference to selective migration. Urban centers are believed to attract the more intelligent people. Others account for the fact by unequal educational and social advantages, while some contend that the tests used favor urban children. There is a positive correlation between the level of intelligence of the inhabitants and the productivity of the soil in rural areas, and negative correlation between intellectual status and the degree of remoteness of the area from urban centers.

Reliable differences in mental status have been found for residents in different sections of the same city, of the same state, and for larger geographical areas. School children in the poorer areas of a city invariably average lower than those in the better residential districts. A wide variation was found for different states and for different sections of the country on the Army test results in the first World War. On the whole the Southern states were lowest, the Pacific coast states highest, with the remaining states varying between the two extremes.

Mental test scores and length of residence of immigrants in the United States show a positive correlation, and the average scores of English-speaking immigrants tend to surpass the average for non-English speaking immigrants. These findings may be the result in part of cultural and environmental influences, and in part due to the nature of the tests used.

Variations in personality are more pronounced than are differences in intelligence. Personality may be defined as an integrated pattern of traits, or as a system of habits. This pattern is unique to every individual, thus, personality is the quality of behavior patterns which differentiate people. Individuals have personality only in so far as they differ from one another. Hence differences in personality are differences in behavior not in structure. Thus, while one's personality may be greatly influenced by hereditary factors, environmental and cultural influ-

ences which surround and mold the individual from earliest infancy through adolescence and beyond are also major determinants of personality.

No single aspect of one's environment can be distinguished as the determining factor of any definable aspect of personality. Rather, it is the totality of the culture pattern or complex areas within those patterns, which mold the personality of the individual. Character, for example, cannot be attributed wholly to religion, training, social or economic status or any other apparent factor in the cultural or environmental background. All traits of personality and integrated patterns of traits are a product of the totality of environmental influences, customs, culture products, attitudes, and other social forces to which the hereditarily unique organism reacted, and the way in which it reacted in the process of development.

Human variations are extremely complex. They have their roots in psychophysical dispositions and conditions which are the result of both heredity and environment and which impinge upon the individual in countless ways. There are many and very vital relationships in any person's background which should be evaluated in analyzing the determining factors of his variations. The essential factor or factors in determining human variations does not seem to be closely related to any particular aspect of heredity or environment, but rather to the total nature of the individual and his relation to the total character of the environment, psychological and material, in which he has functioned. Thus, it is apparent that individual differences are limited only by the number of different individuals and groups and the nature and extent of the variations in traits and combination of traits which characterize them.

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INDIVIDUAL PSYCHOLOGY: ADLERIAN SCHOOL.—*History and Relation to Different Branches of Psychology and Psychopathology.* Alfred Adler was born in Vienna, Austria, in 1870. He went to medical school at the University of Vienna where he received his M.D. degree in 1895. Thereafter, he devoted himself to general practice. His first major publication dealt with working conditions of the tailor trade, pointing out some of the professional dangers to the health of those engaged in this profession. Soon after this, he became interested in psychiatry and began to devote his entire work to psychiatric problems. In 1902, upon the invitation of Freud, he joined the latter's circle. From the very beginning Adler hesitated to join, since he never agreed with the Freudian interpretation of symptom formation of the neuroses. At that time Freud insisted upon the all-importance of sexual traumata for the causation of neuroses, where-

as, Adler had already started elaborating upon the problem of the influence of physical disability upon mental development. In the beginning however Freud encouraged collaboration in spite of the fundamental difference in views and interests. In the following years, this pre-existing difference became more acute during the discussions of the group, and in 1911 Adler left the circle with seven of his followers. The breach was precipitated by Freud's demand to have publication of articles in the journal of the group, whose editor Adler was, dependent on Freud's approval. During the first year after the secession, Adler's group was called the "free psychoanalytic" movement. In 1912 he coined the name "Individual Psychology" for his new psychology. With this name he meant to imply that in order to understand the structure of the personality, in each individual case it was necessary to explore what special meaning interpersonal relations had for that particular case. This tendency was especially exemplified by the Individual Psychologist's effort to explore the personality as a whole which, thus, was opposed to tendencies of psychoanalysis and other trends of psychology to evaluate performance and symptoms as individual entities in themselves. This attitude has elements similar to those of the Gestalt theory and many consider Individual Psychology a practical application and elaboration of the Gestalt theory. Since Individual Psychology (henceforth to be referred to as I.P.) stresses the necessity of taking into consideration the relations of the individual to all the environmental problems as well as intrinsic factors related to physical stimulations or handicaps, it is closely related to Adolf Meyer's psychobiology. The most important link between I.P. and Freudian Psychoanalysis is the stress on the importance of unconscious motivation upon performance and symptomatology. I.P. implies depth psychology, since it is not based on mere description or summary interpretation of personality and personality difficulties, but in each instance explores the deeper roots which are then probed as to their validity to explain the structure of the whole personality.

SUBJECT MATTER OF INDIVIDUAL PSYCHOLOGY

I.P. has been used in various branches of medicine, psychology, history, and literature. In the field of psychiatry and psychology, espe-

cially, it has contributed to the understanding of the normal and abnormal personality development. It finds its practical application in the psychotherapy of the neuroses and, in particular, in child guidance.

THEORY OF THE NEUROSES

1. *The Theory of Organ Inferiority and Its Psychic Compensation.*

The theory of organ inferiority formed the starting points of the individual psychological interpretation of the neuroses. Here Alfred Adler explored the influence that an organ, which is handicapped either through organic defect or through deviation of function, may exert upon the mind. In his writings he pointed out that the mere idea of being subject to a physical or to a mental inferiority was likely to exert the same influence upon the mind as if such an inferiority really existed. Such handicaps may result in either of two diametrically opposed reactions: A person may, on the one hand, react with a defeatist attitude to a handicap and succumb to it. This, for instance, may happen in left-handed children who live under the impression that they are awkward and, consequently, give up trying to use their hands skillfully. In later life they may shift all the responsibility for manual activity to others and may use their congenital defects as an excuse for such reaction. People who act in this way are suffering from an "inferiority complex" which means that they over-react to a handicap. This inferiority complex should not be confused with the "feeling of inferiority" which may act as a normal stimulus, particularly in the growing child, who thus is directed toward emulating to achieve grown-up performance. On the other hand, a handicap may result in greater efforts and interests to overcome such a difficulty. Consequently, such persons may compensate and even over-compensate a given inferiority. On the physical side such development is exemplified, for instance, through the finding of a hypertrophic heart and skeletal muscles which develop under the necessity to overcome obstruction or weakness in other parts of the system. Alfred Adler and his pupils have quoted numerous instances of compensatory processes through mental and physical effort. They pointed to the, by now, popular examples

of orators like Demosthenes who had been stammerers; musicians like Beethoven, who suffered from congenital ear disease; and sculptors and painters, like Michelangelo, who were left-handed. Analogously, they showed that an individual may feel stimulated to overcome a psychologic situation where he feels held back and slighted and may achieve superior results. Thus, Alfred Adler was one of the forerunners of that branch of modern so-called "psychosomatic medicine," which studies the influence of the body on the mind.

2. *The Fictitious Goal of the Neurotic*

In interpreting the symptom formation in neuroses I.P. bases upon the doctrine of the finality of human performance, be it on the conscious or unconscious level. I.P. differs from other trends of psychopathology which look for traumatizing events in the past—which more or less fatalistically are supposed to lead into neurosis—in that it points to numerous observations which imply that the actual events are of no definite importance for later development. It is the use or misuse a particular individual makes of these events that is stressed! To understand the reaction to the events, the individual goal has to be investigated. The sum of the various responses which lead towards this fictitious goal was called the "style of life." Consequently, it may be said that in one case the style of life corresponds to that of an individual whose goal is directed toward useful accomplishments, whereas in another it may be directed toward activities on the useless or anti-social side. For instance, in many neuroses the goal may be to achieve protection from the challenges of life in order to be excused from social, professional, or marital obligations. The basis of such formation was found to lie in a discouraged attitude of the individual rooting back into childhood. The formation of the individual style of life and of the goal is the result of procedures arrived at by the trial and error method. The individual finally stresses what to him seems to be the most successful approach to the solution of his problems. Since in the neuroses the way of arriving at such results is different from the normal way of thinking and acting, the neurotic or psychopath is said to base his reactions on his own "private logic."

3. *Symptom Formation in the Neuroses.*

In order to understand the meaning of symptoms in the neuroses, it has to be explored what use the patient is making of symptoms or, in other words, what particular goal the patient achieves with his symptoms. Often insight into this problem can be gained by directly asking the patient what he would do if he were not suffering from the symptoms in question, for instance, if he were not suffering from fears of crossing open places, compulsion to wash his hands, fear of blushing, and the like. The answer of the patient, usually implying that he then would get married, continue in his profession, take up social relations with his friends, or meet any other challenge, explains the meaning of the symptom in that particular individual. Thus, neurotic symptoms serve the patient as a screen behind which he hides so as to be excused from the "firing line of life." The answer of the neurotic is formulated as the "yes—but" approach. In acknowledging the demands of life the patient follows the general logic of mankind. But through his neurotic symptoms he excuses himself for not following suit. So, for instance, a neurotic would say, "yes," he knew that he should seriously consider marriage to his partner "but" his constant fear of blushing prevents him from taking the necessary steps.

As in other branches of depth psychology, considerable attention is paid to tracing the development of the neurosis back to early life. In summarizing these investigations a type was found described as the "potential neurotic child" which was most likely to develop neurotic symptoms later in life. Such children are rather obedient, peaceful, and obliging but have difficulties in their contacts with playmates and in following some other routine procedures. Their early attitude parallels symptoms found later in the neurotic. Thus, such children will try to join their playmates and follow their obligation in school and at home, "but" they will soon bring about reasons why they should be excused from certain activities. Those are the children who complain of their playmates being too rough, that they are too tired to do any work at school or at home, who vomit their breakfast and consequently feel unable to go to school and similar obligations. This is the early training of the potential neurotic which gives him

the experience of how to be excused from the demands of life through certain symptoms. Since the results mean success to the neurotic, according to his style of life, this pattern is gradually adopted as the basis for the neurosis in adult life.

4. *The Neurotic Character.*

I.P. does not consider character as an inherited structure but rather as the sum of the various situational responses, constituting the unified personality. Deep-seated vanity has been established as one of the main characteristics of the neurotic personality. This results in a constant fear of failures. Since life is full of possibilities of failure such patients are in constant fear. This trend was found to be the result of early discouraging experiences which gave the child the impression that he was unable to equal performance of his environment, and thus led to an inferiority complex. This, in turn, may be caused by experiences in any field and usually not only by one experience but by an accumulation of experiences in any field of contact, which may be misinterpreted and so, secondarily, made into causative factors of neurotic development. Around this fundamental vanity other characteristics, such as jealousy, maliciousness, stubbornness, and suspiciousness are grouped, completing the character of the neurotic. These characteristics are the result of the ever-present tendency of the neurotic to depreciate others in order to feel superior by comparison. In addition, such patients are often cowardly, fearful, craving for sympathy, and tyrannical in their demands upon others, since they feel helpless without the sustained protection of their relatives or friends.

5. *Social Interest.*

An additional differentiation between the normal, and the neurotic and psychopath has been elaborated by I.P. Normally, our actions are directed, in the final analysis toward achievements that benefit the welfare of the human family. Thus, our actions are controlled by Kant's moral law which postulated that a human being is to act so that the principles of his activities could be made into the fundamentals of a general code of law. In normal people this kind of activity is, in many instances, almost on an automatic level. In the neurotic

and psychopath those inner laws are transformed and circumvented in accordance with their "private logic."

THEORY OF PSYCHOPATHY

According to general usage the term psychopathy includes criminals, alcoholics and other drug addicts, and a variety of misfits suffering from primary difficulties of adjustment. The pattern of the psychopath is characterized as a "no" answer to the various obligations. Such individuals decline realization of moral laws pertaining to the whole of humanity. Instead, they proclaim their own wish fulfillment as of primary importance regardless of the hardship it may impose upon others. Many examples of this kind can be found in history among "leaders" of nations, and in the life history of other notorious criminals. Whereas a neurotic declares it a failure if through his symptoms he is prevented from achieving worthwhile goals, the only failure the psychopath usually acknowledges is being caught or prevented from achieving all of his adverse plans. As in the neurotic, a type of the "potential criminal" has been elaborated. Such children show early signs of revolt, decline responsibilities and fight for what they want to get. The basis of such a pattern is often found in a child's sense of being neglected and the resulting feeling that, unless he forces his environment, he will perish.

INFLUENCE OF EXOGENOUS FACTORS ON DEVELOPMENT

1. *Type of Basic Difficulty.*

I.P. has elaborated on three types of children who are most likely to develop difficulties in later life: the pampered, the unloved, and the child with a physical handicap. Of these three groups the largest is that of the pampered. Such children grow up with the idea that the whole world revolves around them. No difficulties may be realized during childhood which represents a protected period during which adjustments are made to the child by its environment. Disturbances are, however, likely to develop once the child is thrown upon its own resources as he is after reaching a certain age or, when he is deprived of his favored situation. The latter occurs upon the arrival of a sibling. At that time difficulties of adjustment may develop, thus showing that the child has not been prepared

to share with others. Symptoms like bedwetting, destructiveness, disobedience, eating difficulties, and the like may develop as an indication that the child does not feel able to adjust in the normal way.

Unloved children are found particularly among illegitimate children and in broken marriages. Such children miss the most important experience of early childhood, namely, that of a relation to a thoroughly reliable companion, the mother. They grow up as if in enemy's country where they have to fight in order to survive. This is the pattern of early life in many later criminals.

The difficulties encountered by children with physical handicaps have been dealt with above.

2. Position in the Family.

I.P. has pointed to the fact that children of the same family vary considerably according to whether they are the youngest, second-born, eldest, a boy followed by a girl, twins, an only child, and the like. In the following a characterization of these different types is given. The youngest in a family sees ahead of him his other siblings whom he realizes he never can equal when developing at the same rate of speed. Consequently, he often develops as if cast from a different mold. Examples of this type are accounted for all through the ages and nations. For instance, the hero of the fairy tale, "Little Hop O' My Thumb," the youngest of seven brothers, puts on seven-league boots and runs faster than all of the others, through his cunning kills the giant, and liberates his brothers. In many academic families, the youngest becomes a dancer or actor, thus earning his living and achieving independence earlier than his older siblings. On the other hand, such children may develop the desire to stay always "the baby" of the family, being closely attached to the mother and unable to develop grown-up independence. The second-born often reacts as if under constant pressure, having before him the shadow of the older. He often develops faster than average and overruns the older. Frequently, he fights authority and continues doing so in later life, thus courting difficulties with his environment. If directed toward useful channels, however, his ambitiousness may stand him in good stead. The eldest is often conservative as if he wanted to preserve his

favorable position for later life. Accustomed to being an authority among his siblings, he may miscalculate steps in his later life through incorrectly anticipating agreement from other sides concerning his plans. On the other hand, he may develop a great deal of foresight as a result of early training. A boy who is followed by a girl often develops profound discouragement during early adolescence when he suddenly feels overrun by his younger sister since girls develop at a faster pace during early adolescence than boys do at that period. Often gradual failure in school is noticed under such conditions, as an expression of the deep discouragement of the young boy who compares himself unfavorably with his growing sister. Twins, identical twins in particular, are found to be practically always on the best of terms. This is a result of their being treated as equals with the same rights and restrictions. Thus, they realize the benefit of mutual cooperation for common interests. On the other hand, they are often handicapped by their exaggerated dependence upon each other which makes them feel insecure when thrown upon their own resources. Finally, difficulties of the only child were pointed out and have been dealt with previously under those of the pampered child. In all such instances the individual development cannot be predicted. But there are definite problems connected with the position of the child in the family which have to be answered by the child in one way or another. Realization of the existence of these problems is the prerequisite of correctly dealing with them as an educator or psychotherapist.

INDIVIDUAL PSYCHOLOGIC PSYCHOTHERAPY

Extensive use of psychotherapy has been made by I.P. in the treatment of neuroses in adults and children, in child guidance, and in treating psychopaths. The results of psychotherapeutic treatment of the so-called functional psychoses were considered discouraging in the severe cases and conducive to temporary and partial success only in light (which means easily approachable) cases of manic-depressive insanity and of schizophrenia. No attempt at treatment of the symptoms in the organic psychoses as, for instance, general paresis, was ever encouraged by I.P.

Three steps have to be differentiated in indi-

vidual psychologic psychotherapy. First, the psychotherapist has to gain an understanding of the meaning of the patient's difficulties, of his basic conflicts, and of the goal that is to be achieved with the help of his symptoms. Secondly, the patient is made aware of these mechanisms, and understanding and insight have to be given him. Finally, the patient has to be guided in his new ways of adjustment. For the experienced it usually does not take long to understand the basic difficulties of his patient. Usually the first few sessions suffice for this purpose. But the patient does not profit if such knowledge is put before him bluntly. At that stage his conflicts prevent him from dealing with his problems on a conscious level. Consequently, his understanding has to be increased gradually through interpretation of his various performances, of his dreams, and of his first recollections. During the final period, the patient is encouraged and helped to apply his newly acquired insight in his daily activities. During the whole course of treatment a friendly, encouraging attitude is maintained. No attempt is made to develop any closer tie between psychotherapist and patient. On the contrary, any development of dependency is discouraged. I.P. points out that it would be in keeping with the style of the neurotic, who habitually abuses the services of others for his own sake, to let such a dependency develop. Consequently, this would not present anything but a repetition of previous performance and, therefore, implies a loss of time for the patient. In serious cases the patients are seen three to five times weekly, at least in the beginning. As soon as possible attempts are made to diminish the number of the patient's visits in order to enable him to train himself in the use of his recent knowledge. Lighter cases, which means cases that are able to control their thoughts and emotions to a larger extent, are seen at greater intervals, often only twice weekly even at the beginning of the treatment. The patient is told to discontinue treatment after a few weeks unless he himself notices improvement by that time. The duration of treatment varies in each case. However, treatments are hardly ever prolonged beyond the one year, and average several months.

In children treatment is usually of shorter duration, and children are seen at greater intervals than adults. A question frequently asked

is how much insight should be given to a child. This depends upon a child's intelligence, age, and interest, all of which should be used to the limit, but never beyond it, for the explanation of genesis and meaning of the child's symptoms. Cooperation with the parents is a prerequisite in all cases. The child is more dependent upon his parents' relation to him than upon any other relationship. Therefore, treatment of children may prove to be futile unless cooperation of the parents can be secured.

I.P. figures as a pioneer in the propagation and demonstration of child guidance inasmuch as in Vienna up to thirty child guidance clinics were conducted under the supervision of trained individual psychologists. There the first child guidance clinics were opened in 1920. Most of them consisted of a psychiatrist, a psychologist, and either a teacher or a social worker. Most of these child guidance clinics were conducted in close relationship with the various public schools. About 1934 most of these child guidance clinics had to be closed by order of the totalitarian Austrian government. Individual psychologic clinics for adults and children are operated at present in New York and Chicago.

POINTS OF IDENTITY WITH AND OF DIFFERENCE FROM PSYCHOANALYSIS

The most important link between I.P. and Psychoanalysis is the evaluation of unconscious motivation for the formation of symptoms in the neuroses, a procedure based upon early investigations of Breuer and Freud, and of Janet. Both stress the importance of early formative years upon the later development. During psychotherapy, both schools attempt to bring unconscious conflicts to the surface in order to let the patient deal with them on a conscious level. Both schools use dream interpretation, evaluation of early recollections, and interpretation of errors, like slips of the tongue, during psychotherapy. The principles of both schools are "dynamic" and pertaining to the realm of depth psychology. There are, however, many differences between the two schools as to theory and practical application of material. From the beginning of his acquaintance with the Freudian school, Adler had objected to the sexual interpretation of all neurotic symptoms as it was postulated by the psychoanalytic school. Only

recently such postulates were gradually modified, thus effecting an approach between the two schools of thought. In opposing the Freudian views, Adler had always explained that conflicts related to occupational or social spheres may be as pathogenic as sexual conflicts. Moreover, in many instances, I.P. demonstrated that sexual problems represented secondary development related to a primary disturbance of adjustment, whereas the Freudian school postulated a sexual trauma as the origin of mental disturbance. Similarly, I.P. holds that the now popular "Oedipus Complex" is not the cause of the neurotic manifestations but, if present, is the result of any early maladjustment, typically present in pampered children who are unable to share with others. Consequently, they are unable to share the mother with the father but, just the same, they have conflicts in sharing the father with the mother, their playmates with other children, or even inanimate objects like toys with other children. These observations dispose of the sexual interpretation of the "Oedipus Complex." During psychotherapy the development of close dependency, as postulated by the psychoanalytic school as the prerequisite for successful psychotherapy, is discouraged and considered as an attempt on the side of the neurotic to continue his previous pattern. Consequently, by the elimination of this stage much time is gained, and treatment seldom exceeds one year. Other than in psychoanalysis, early recollections are evaluated regardless of whether they are given spontaneously or produced after exploring the realm of the unconscious mind. Another difference from psychoanalysis is that no attempt is made to give such recollections a sexual interpretation, but I.P. points out that such early recollections are an indication of the predominant line of interest of the individual at this early age. Such early recollections, it is contended, are preserved and remembered because of their particular importance for the individual, but not because they are an expression of sexual conflicts. Similarly, there is considerable difference between the individual psychologic approach to dream interpretation and its use in therapy and that of Freudian psychoanalysis. At first, Freud explained the dream mechanism as representing a wish fulfillment of sexual desires. This theory was modified only recently when it was acknowledged that conflicts other than sexual in nature might occa-

sionally be responsible for dreams. I.P. explains dreams as the result of open conflicts of the preceding day, these conflicts being related to any possible sphere of life. Consequently, whereas psychoanalysis interprets the different elements of dreams as representing sexual symbols or related to sexual activity, I.P. interprets the dream content on a wider basis. Generally speaking, whereas psychoanalysis stresses the importance of past conflicts, sexual in nature, as responsible for the causation of mental trouble, I.P. elaborates on the structure of the whole personality and its relations to all the important spheres of life which in turn determines the individual use and misuse of past experiences.

MOVEMENT OF INDIVIDUAL PSYCHOLOGY

After Adler's separation from Freud in 1911, several branches of I.P. were formed in the years following, with quarters in Europe and in the United States. At the time of Adler's death, on May 28, 1937, in Aberdeen, England, while he was lecturing at the University, there were twenty-three groups listed, most of them quite active in research and child guidance. The official organ was the *International Journal of Individual Psychology* which was founded in Vienna in 1922 and continued publication until 1938, under the editorship of Alfred Adler. After his death his daughter, Alexandra Adler, became editor until Austria's annexation by Germany in 1938 stopped further publication. The *American International Journal of Individual Psychology* was founded in 1935 with Alfred Adler as editor. Publication has been continued up to date in various forms. At present the *Individual Psychology Bulletin* is the central organ, published as a quarterly. The editorial office is at 24 Wabash Avenue, Chicago 2, Illinois. Dr. Rudolph Dreikurs serves as editor. The war has, of course, interrupted the activity of the European groups. In the United States there are, at this time, active groups in New York and Chicago.

As it goes with most modern trends in psychology, the attitude of different psychiatric and psychologic circles towards I.P. also varies from complete acceptance to partial rejection.

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INDUSTRIAL PSYCHOLOGY. — The psychology of individual differences is the underlying principle upon which most of industrial psychology is based. Experiment as well as experience proves that people are not alike in basic ability, education, training or personality makeup. Job analyses similarly show that jobs vary greatly in their requirements. One of the major purposes of industrial psychology is to place men and women on jobs that match their abilities and potentialities. By so doing, a more effective use of personnel is made because men are not discouraged by jobs beyond their ability or capacity nor are they left unchallenged by jobs which demand only a part of their capabilities.

The matching of abilities with job require-

ments is accomplished most effectively by a proper use of personnel tests in conjunction with other employment procedures, such as the interview, work record, and application blank.

Mental Alertness Tests. These tests, sometimes referred to as intelligence tests,¹ go far toward a proper matching of men and jobs. Simple jobs, such as assembly, fixed gauge inspection, packing, etc., are usually done most satisfactorily by persons who score relatively low on mental alertness tests. Such jobs are neither boring nor monotonous to persons whose general alertness and ingenuity are not such as to require greater stimulation for complete activity. On the other hand, jobs calling for layout, design, policy making and other activities of this type are best performed by persons scoring relatively high on mental alertness tests. Studies which show experimentally and statistically the facts upon which the above statements are based have been published by Bills,² Pond and Bills,³ Tiffin and Greenly,⁴ and Tiffin and Lawshe.⁵

Mechanical Aptitude Tests. Another type of test effectively used in industrial personnel deals with mechanical comprehension or mechanical aptitude. Under this category are considered tests covering comprehension or understanding of mechanical principles or retention of experience dealing with mechanical contrivances. Typical of such tests are the Bennett Test of Mechanical Comprehension,⁶ the Purdue Mechanical Adaptability Test,⁷ and the Purdue Industrial Training Classification Test.⁸ Tests of this type have been shown to have satisfactory validity for placing men on such machines as conversion machinery in a paper mill,⁹ and in the selection of apprentices and trade school students.¹⁰

Dexterity and Muscular Coordination Tests. The mechanical aptitude tests discussed in the preceding section deal with the *understanding* aspect of mechanical operations—not with the muscular or motor phases of the job. For the latter, dexterity tests have been found more usable. Typical dexterity tests are the O'Connor Finger Dexterity Test¹¹ and the Purdue Peg-board.¹² Numerous investigations with tests of this sort show their effectiveness in placing operators on jobs such as assembly, packing, and the operation of simple machines where the work is essentially repetitive and requires a minimum of understanding of the principles of the machine by the operator.

Trade Tests. Frequently applicants for a certain type of skilled job have had (or claim to have had) previous experience which presumably qualifies them for the job in question. Thus an applicant for a stenographic job is supposed to possess a certain level of skill in typing; a tool maker, certain skills in the operation of machine tools; and an electrician, certain skills in this trade. Standardized trade tests in these, and many other areas, are available.¹⁴

Personality and Interest Tests. Numerous studies, such as one reported by Hunt,¹⁵ show that personality factors, rather than lack of trade or technical skill, very often prevent a man from getting along well on his job. The experience of personnel men also emphasizes the importance of personality factors in successful job performance.

To meet the need of appraising personality characteristics of applicants by test procedures, a number of personality tests have been developed. These include such tests as the Bernreuter Personality Inventory,¹⁶ the Humm-Wadsworth Temperament Scale,¹⁷ and the Guilford-Martin Personnel Inventory I.¹⁸

These tests variously measure several aspects of personality, such as introversion, extroversion, objectivity, dominance, agreeableness and cooperation. In the case of the Humm-Wadsworth Scale, several tendencies formulated around psychiatric concepts are measured.

The proper use and interpretation of personality tests require considerable skill and experience. Usually the pattern of personality characteristics revealed by the test is more meaningful than any single trait by itself. Also, personality test scores should usually be interpreted in conjunction with a mental alertness or intelligence test score. When used with proper precautions, personality tests frequently yield valuable information concerning applicants and employees.

Interest tests are also helpful in allocation of industrial employees and in vocational guidance. Among the more widely used tests in this field are the Strong Vocational Interest Blank¹⁹ and the Kuder Preference Record.²⁰ The former is intended primarily for use in vocational guidance of students who are choosing a career; the latter is also widely used for this purpose and is also used effectively in the placement of industrial and sales personnel.

Vision Tests. It has long been customary for industrial employment and medical departments

to give a vision test to new employees. This has been done both because it furnishes a medico-legal record in case compensation is sought by the employee for real or alleged injury to his vision, and also because of the recognized fact that many jobs calling for accurate and/or continuous visual observation cannot be adequately performed by persons whose vision is not satisfactory for the job.

The most commonly used industrial vision test has been the Snellen Chart,²¹ which contains letters of decreasing size which are read by the person being tested at a 20 foot testing distance. The test measures visual acuity or visual discrimination at this distance. Occasionally, but not frequently, the Snellen Test has been supplemented by a near point test.

Recent research has shown that the correlation between visual acuity at 20 feet and at 13 inches is far from perfect,²² and, in a few instances, a significant negative correlation between distance visual acuity and efficiency in performing a near point job has been found.²³ Certain visual skills in addition to visual acuity, either near or far, have also been found related to job success in numerous kinds of industrial jobs.²⁴

In order to make available to the industrial psychologist, the industrial personnel manager, and the industrial physician, a convenient and rapid means of measuring visual skills necessary for efficient job performance in various industrial jobs, the Bausch and Lomb Optical Company has recently made available a new vision testing instrument known as the Ortho-Rater. This instrument makes possible a factual determination of the pattern of visual skills required for each job or family of jobs so that by careful employee placement and adequate use of professional eye care every employee can be assured of adequate visual skills for the job he is hired to do.

Training Methods. Educational Psychology and the psychology of learning have revealed many principles which make learning more effective. This work has long formed the basis of instruction and preparation of instructional materials in elementary and secondary schools. Much, if not all, of the training given to industrial operators can make use of many of these same psychological principles of effective teaching and learning. Within the past few years industrial training departments have made a

greater and greater use of psychological principles in the operation of their training programs. Several specific studies dealing with this application of psychology are summarized by Lawshe.²⁵

Merit Rating. In every line organization men are judged or rated by the persons for whom they work. A recent survey has shown that at least a third of industrial plants have some type of formal rating system in operation.²⁶ These ratings often form the basis of transfers, promotions, and, in some instances, terminations. Psychology fully recognizes the possibility of errors in connection with ratings of this sort—errors such as the halo effect²⁷ which is the tendency to rate an individual either high or low in many traits because the rater knows (or thinks) the individual to be high or low in some specific or particular trait. This and other difficulties in merit rating can be markedly reduced by adherence to certain principles which have emerged from basic statistical studies of ratings.²⁸

Inspection. This is another area of industrial operation to which scientific psychological methods have made several specific contributions. Not only do tests assist in the selection of applicants for certain types of inspection jobs, but analyses of the job and an enumeration of the skills (visual and otherwise) required for adequate job performance often result in a job simplification in which more frequently found (or easily developed) skills may be substituted for rarer skills. Sometimes by changing the job itself, sometimes by more specific training of the inspectors, and sometimes by a more careful allocation of persons to the job—by these means quality of inspection can often be definitely improved.²⁹

Accidents and Safety. Numerous studies have shown that accident proneness is a significant cause of an appreciable percentage of industrial accidents.³⁰ Other studies have revealed at least some of the factors which tend to cause accident proneness.³¹ Recently a number of studies showing the relation between vision and industrial accidents have been published.³² Studies of this type not only aid in identifying some of the basic causes of industrial accidents but aid management and the safety director in initiating and operating a safety program which reduces those hazards that have been found due to personal factors within the worker.

Attitudes and Morale. How a worker feels about his job, his working conditions, and his company often determines how satisfied and effective an employee he becomes. The view, prevalent in some quarters, that money and wages are the only factors that cause employee dissatisfaction is not supported by the facts revealed by analysis of employee attitude surveys or union-management disputes. Morale surveys such as those reported by Hersey³³ and Wyatt, Langdon, and Stock³⁴ show that such factors as steady employment, fair adjustment of grievances, and receiving necessary help from management frequently are considered more important than wage increases by a majority of employees. It is also interesting to note that the majority of union-management dispute cases going before the National War Labor Board during World War II were concerned with matters other than money and wages.³⁵ Standard psychological methods of sampling employee opinion and feeling furnish management with a tool of real value in establishing and maintaining a program of sound industrial relations.

Industrial psychology is essentially the application of psychological methods to the solution of problems involving industrial personnel. Both management and labor organizations are recognizing the value of these methods in establishing a better understanding between management and labor and in settling controversies by objective methods rather than by arbitrary rule of thumb or decisions based on emotion rather than logical and carefully obtained facts.

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NOTES

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INFANT PSYCHOLOGY. — The main problem of the psychology of infancy is to discover and describe how the behavior endowment of the newborn child develops during the first years of life. Its first task is to understand the elements and factors which constitute the cross section of behavior during the post natal period, and when this has been accomplished, to trace the transformations as they occur during the first two years of life. In a sense this broadly is the problem of the transformation

of the newborn human organism into a person. Unfortunately the problem of the infant's personality is the least studied datum in the field of infant psychology. It is evident that at birth the child is an individual organism but is hardly a personality in the accepted meaning of the term. The efforts of infant psychologists have been largely directed toward various conventional aspects of development such as emotional and social development, learning, speech, sensory and motor abilities, and mental testing.

The complexity of early development together with many gaps in knowledge of infant behavior are handicaps to an adequate coverage of the entire field. Moreover, the following treatment represents only one selection in the interest of brevity of the mass of data available.

SOCIAL REACTIONS

A very significant fact about the life of the newborn infant is that, while it is not a socialized being, it is one of the main foci of stimuli in the complex social environment of the home. The influences of this environment at first are directed upon the satisfaction of the child's physical needs and then increasingly it is bombarded with stimuli of strictly a personal or social nature. Gradually the child during its first years learns the habits of social living until it has adopted the culture patterns into which it has been born. The studies in this area of infant behavior have been directed not so much to the process of the socialization of the infant from birth but to the preliminary matter of recording behavior items which may be categorized as social. In listing possible items of social behavior the problem of adequate observational and experimental controls has not received adequate consideration.

Although the newborn infant is not a socialized creature, the two-year-old is an amazingly socialized person. Its social responses represent a process of differentiation and reintegration of uncoordinated responses which appear upon the background of its early chaotic and amorphous behavior. These patterns may conveniently be reviewed under three headings, responses to adults, responses to other infants, and responses to complex social situations.

The human adult is one of the first stimulating objects in the infant's environment and the face of the mother is a prominent aspect of

it. During the first days of life an infant may fixate the human face as it will fixate a light or any other object. These early fixations of course have no social significance until they become conditioned to a social situation. After six to eight weeks the baby will fixate the face quite frequently and often will smile. It is difficult to determine whether the first smiles in response to the face are due to the social situation or are induced merely by internal or gastric conditions in the infant. It has been found that at two months the baby will smile to the combined stimuli of the face and a clucking sound, that not until about five months will it react differently to a smiling and a cross face, and that at about seven months the child tends to reflect the assumed expression.

At an early age the infant begins to react to the mere presence of an adult. During the first quarter year of life it will usually follow the adult's movements but it also will follow the movements of any other physical object. Before the end of this period it will stretch out its arms, coo, and show increased body activity at the approach of the mother. Soon thereafter when the reaching and grasping patterns appear it may touch and manipulate the hand, arm, face, hair of the adult as it would any other objects. During the second quarter year activity and smiling are apt to be inhibited by the presence of strangers. By the sixth month infants jabber at adults. The social significance of all these activities is not clear.

It is known that newborn infants respond to some aspects of auditory stimuli. During the first two months the human voice has only a medium effect in relation to other auditory stimuli, although smiling has been found to occur in response to the voice. At this age a crying baby will cease crying at the sound of the voice. From about five to seven months an infant will cry in response to a cross or scolding voice. Although these responses are called forth by people there still is a question as to their social quality.

At about six months the infant will ordinarily cooperate with adults in such play as peek-a-boo, waving bye-bye, pat-a-cake. From eight to ten months raising and lowering of arms in imitation of adults is customary. Soon after a year the child will cooperate somewhat in dressing. Simple commands accompanied by gestures may be expected to be reacted to positively at about

a year, and to negative commands somewhat later. Negativism becomes prominent during the second year of life.

Infants at first do not respond to other infants. It has been observed that newborns in an obstetric nursery will all cry at about the same times in the twenty-four-hour period. It would be presumptuous to interpret this as a social reaction. Rather, the infants are hungry at about the same time and crying is a result of this internal state. When victrola records of crying are played the results have been found to be negative, the infants cry as frequently when the records are not played as when they are. It is reported that vocalizing in imitation of other infants appears from nine to ten months.

Aggressive behavior such as taking a toy from another, some resistance, hitting, hair pulling and biting for fun is evident toward the end of the first year, and is more prominent during the first half of the second year. Instances of affectionate and patronizing behavior toward younger infants have been reported at about the fifteenth month. During the first year of life children are unable to maintain contact with more than one individual at a time. Eighteen months is the earliest age at which group contact of three children has been reported.

It should be emphasized that the above description of infants' responses to other infants may not necessarily involve a true social situation. They may merely be responding to other infants as to any moving physical object placed before them. It is therefore difficult to determine to what degree infants respond to a complex social situation. It has been stated that a nine-month infant will cry if an adult pays attention to a nearby child. However it has been found that after two infants of this age have been together for a time and if the mother fondles her own baby and then picks up, fondles and talks to the other, the results are negative.

An interesting problem concerns the effect of different cultures upon the patterns of behavior of infants. The culture of a group determines the customary routine of the infant. Such matters as cradling, feeding routines, rewards and punishments have effects on infant behavior. Thus cradling on a board by a Hopi mother may accustom the child to certain sleep habits and the use of the breast may re-

duce the amount of crying. But the infant response patterns as such do not vary from culture to culture. Thus the Hopi or Navaho infant may not cry as much as White babies, but the cries are the same. Present evidence does not indicate that before one year of age there are any gross differences in infant behavior. A similar observation is made on racial differences of infants. During the second year of life the culture begins to condition infant behavior. Language is a case in point.

The study of the social reactions of infants needs further clarification such as will come with the use of more careful controls, the break-down of the general problem into easily handled experimental problems. Among these problems the first which should be attempted is perhaps the processes of learning by which the infant becomes socialized.

SPEECH DEVELOPMENT

One of the most striking processes of socialization during the period of infancy is the acquisition by the child of the language of his culture group. Speech, of course, is *par excellence*, an effective basis of social living.

The birth cry is usually a vowel sound, a nasalized *a* as in *sat* and represented in the International Phonetic Alphabet by the symbol [æ̃]. It may occasionally be varied so as to reproduce the sound *e* as in *set*, or *u* as in *hut*. Consonantal sounds also may appear but less frequently than vowels. The sounds *ng* and *ch* have been reported.

Thirteen investigations may be found in the literature of infant vocalization during the first month of life. It is convenient to list the sound elements used at this time under the three classifications of crying, whimpering, and non-crying, and to give them in the symbols of the International Phonetic Alphabet.

Crying

[i], [e], [æ], [A], [ɔ], [ɪ], [h], [ʔ]

Whimpering

[i], [ɪ], [e], [æ], [A], [k], [h], [ʔ]

Non-Crying

[i], [ɪ], [e], [æ], [A], [u], [k], [ɪ], [h], [ʔ], [g]

About seven reports on the speech of six month-old infants are available. The following

speech elements are heard under the conditions of crying and non-crying.

VOWELS

Non-Crying

[i], [I], [e], [ε], [æ], [Λ], [ə], [a], [ɔ],
[o], [v], [u]

Crying

[i], [I], [e], [ε], [æ], [Λ], [ə], [a], [ɔ], [u]

CONSONANTS

Non-Crying

[m], [n], [b], [g], [t], [k], [w], [l], [j], [θ], [h]

Crying

[m], [n], [b], [d], [k], [j], [h]

It is apparent that by the end of the second quarter of the first year of life infants produce most of the vowel elements and about half of the consonants. If the speech status of newborns and that of six month infants are compared a great expansion in the mastery of sounds is discovered.

At eighteen months the following individual sounds were heard in one sample of infants.

VOWELS

[i], [I], [e], [ε], [æ], [Λ], [ə], [a], [ɔ],
[o], [ɔ], [u]

CONSONANTS

[p], [b], [m], [w], [f], [v], [θ], [t], [d],
[n], [s], [z], [ʃ], [ʒ], [l], [r], [j], [ç],
[x], [y], [k], [g], [h], [ʔ]

When vowels are classified according to front, middle and back infants at a year and a half show a distribution of 54 per cent front vowels, 15 per cent middle vowels, and 31 per cent back vowels. These values may be compared with the vowel distribution of adults which is: front vowels, 48 per cent; middle, 19 per cent; and back, 33 per cent. The two distributions are approximately the same. Thus at eighteen months a sample of infants may produce practically the whole vowel and consonant equipment needed in meaningful adult English speech, but may produce them in the same proportion before meaningful language has been achieved. The corresponding values for newborns are 85 per cent front vowels, 15 per cent for middle, and 0 per cent for back vowels. Thus it is seen that vowel development during infancy is largely the acquisition of back vowels

with a diminution of the production of front vowels.

It was stated above that all the vowels and consonantal sounds used in adult speech may be present at eighteen months of age. This statement is based on the sample of sounds used by 33 infants. No individual infant at this age had achieved the total adult phonetic equipment. However, when the mean number of phonemes of 100 infants from the first to the thirtieth month of life is plotted the resulting curve is a parabola. The mean number of elements present at the first month is 8 while at 30 months the mean is 27. The equation for the curve is $y = 7.5x^2$.

The literature yields comparisons of consonant production of infants during the second quarter year of life and the sixth quarter year. If consonants are classified according to the manner of articulation 2 per cent of such sounds are nasals in the early period and 10 per cent in the later period. Plosives amount to 29 per cent as against 48 per cent, semivowels respectively are 9 per cent and 11 per cent, and fricatives 60 per cent and 30 per cent. The changes in proportion of types of consonants according to the place of articulation between newborns and year and a half infants also is quite radical. The frequency of labials, dentals, post dentals, and palatal is practically zero for newborns. For the year and a half child the corresponding categories amount to 27, 1, 24, 4, and 10 per cent of consonants produced. At birth velars amount to 5 per cent, at the later age the amount is 10 per cent. At birth glottals are 95 per cent of the total consonantal production, at eighteen months it is 24 per cent.

Very little systematic study of the patterning of sounds has been attempted by workers during the first year of life. This period is a medley of vocalizations usually called babbling. During the first six months babbling is dominated by vowel sounds, increasingly during the second six months consonantal usage appears.

The first words appear at the end of the first year of life in the form of word approximations. The sentence appears somewhat later in the form of a one-word sentence. However, it is a sentence only in a functional sense, its structural differentiation into subject, predicate and modifiers being a product of late infancy. The ten most frequently used words in constructing the sentence are: "I," "is," "it," "you,"

"that," "do," "a," "this," "not," and "the." From two years the length of the sentence will increase from 1.7 words to 4.6 at five years. Nouns and verbs are used more frequently than adjectives and connectives. Declarative sentences predominate when the child masters the sentence form. The ability to express itself with reasonable clarity if not with complete maturity is evident normally at two years.

LEARNING

A number of investigations have been performed on the learning ability of the infant. Most of them have approached the problem by means of conditioning techniques.

Some of the responses of infants which have been conditioned are feeding or sucking, withdrawal of limbs, eyelid closing, fear and other emotional responses, and the psycho-galvanic response. Stimuli which have been used in these experiments include the sound of a bell or buzzer, an organ tone, colored lights, mild electric shocks, tactile stimuli such as tapping by a cutaneous vibrator, live objects such as rats and snakes, and also colored milk bottles and toys. The conventional procedures used in the conditioning of animals have been followed with infants. Departures from conventional techniques have been the introduction of experimental controls. These have been of two types, one in which a control period has been introduced in the individual infant's performance and a second in which a separate group of infants have been used. There is a tendency to treat results statistically as well as individually. Moreover, when non-instrumental recording, that is by an observer, is used, reliabilities of observation have been established.

Conditioning phenomena have been found present throughout the whole period of infancy including newborns. There is good evidence that simple conditioning may be established during the first week of life, that feeding reactions of the infant may be conditioned to the sound of a buzzer, that changes in feeding schedules may be conditioned, that on the fifth day eye-lid closure may be conditioned to tactile vibratory stimuli on the plantar surface of the foot, withdrawal or flexor twitches and respiratory gasp in response to a pure tone, and that withdrawal responses to visual stimuli may be set up on the sixth day. Anticipatory reactions have been observed during this period. It usually requires a

large number of pairings of stimuli to set up the response at this time. On the whole it may be stated that conditioning of newborn infants occurs but usually after many pairings of stimuli, and then only in a quite unstable manner.

During the second month of life and throughout the period of infancy conditioning becomes more easily established. Retention may last as much as from a few days to more than a month. Feeding responses to auditory stimuli may be set up during the second month. Clear differential conditioned responses, with an organ tone and an electric bell as stimuli to be differentiated were obtained between 110 and 122 days after birth. The infant of four months is able to differentiate a difference of five and a half tones. Conditioned reflexes in response to light are formed by the end of the second month. The first visual differentiation (colors) is formed in the fourth month of life. The Russian investigators incline to the view that the time of formation of auditory and visual conditioned responses does not depend as much on the number of pairings of stimuli as upon the age of the infant.

Among conditioning phenomena which have been observed with infants are: external inhibition, generalization, experimental extinction, internal inhibition, spontaneous recovery, inhibition of inhibition, differential conditioning, trace response, and higher order conditioning. One study has reported that when newborns are in a state of complete muscular quiescence the strength of response decreases and finally drops out. This would point to the existence of an optional amount of activity as a condition for successful results. It has been found that with continued pairings a high level of conditioning may drop to a somewhat lower level. Moreover when the infant is satiated it is difficult to successfully condition it. This indicates that contiguity is not the only factor for conditioning but that motivation likewise is a necessary factor in the process. It has been found that when an electrode is attached to the arm and electric shock is paired with the sound of a metronome the first responses are generalized so as to include the legs as well as the arms and that later the response becomes localized upon the stimulated arm. Anticipatory effects accompany the transition from the generalized to the local type of reaction. Thus infant conditioning processes show a stage of generaliza-

tion of responses as well as the stage of generalization of stimuli exhibited in animal work. Moreover there is evidence that other responses of the infant become conditioned at the time that the particular response in which the experimenter is interested is developed. The conditioning of these concomitant and associated responses would indicate that there are adaptive features present during early infancy. The conditioning process has been used experimentally both to induce fear of objects and to eliminate emotional responses in infants.

Curves of the rate of acquisition of the conditioned response are found to be S-shaped. This type of curve might be expected to hold for infant learning. The initial acceleration is probably due to the fact that the infant has no endowment of previous experience to bring to the learning situation. Interestingly, curves of the rate of decrement for successive experimental extinctions show a reversed S-shaped curve which is a mirror image of the curve for rate of acquisition. This is true for the first curve of a series of extinctions.

The instances of infant conditioning described above are concerned with laboratory procedures. Little work has been done in studying conditioning as it occurs during the actual process of socialization, that is, conditioning infants to the social and cultural environment into which they are born. Some beginnings, however, have been made with the infant in primitive cultures. A non-experimental attempt to describe the learning process of the Kwoma infant has been made. It consists in the application of a learning paradigm to a number of illustrations of the modification of infant behavior in the pre and post weaning periods. The paradigm is in terms of drive, response, cue, and reward. Some interesting observations of the modification of infant behavior in the Hopi and Navaho cultures also are available.

EMOTIONS

The problem of the emotional endowment of the newborn and its subsequent modifications and development has not yet been entirely clarified. This may be due in part to the absence of a clear-cut definition of emotion and in part to a lack of research.

According to Watson there is a group of emotional reactions which belong to the original

and fundamental nature of man. These reactions, designated as fear, rage, and love, are to be defined objectively in terms of situation and response. Fear responses consist in sudden catching of the breath, clutching randomly with the hands upon dropping, sudden closing of eyelids, puckering of lips and crying. The situations which arouse the fear pattern are dropping or loss of support, and loud sounds. There is no fear of darkness at birth. The rage pattern includes crying and screaming, body stiffening, slashing of hands and arms, drawing up and down of feet and legs, holding the breath and flushed face. This pattern is evoked by hampering the movements of the infant such as holding the arms tightly to the sides, clasp the elbow joint tightly between the fingers. Love connotes a broad meaning resembling approximately the sense of Freud's term *sex*. If the infant is crying, crying ceases, a smile may appear, gurgling and cooing are present. The smile and laugh are classed as original reaction tendencies. The situations in which love responses appear are stroking or manipulating an erogenous zone, tickling, shaking, gentle rocking, patting, turning upon stomach across attendant's knee.

It is to be noted that these three types of emotional reactions meet the criteria of emotions: a reaction pattern, a definite stimulus, no particular adjustment made to an object in the environment, responses which contain both skeletal and visceral elements.

This highly publicized view of the human being's original emotional endowment has been repeatedly challenged until now it finds little credence. The validity of Watson's account suffers from demonstrations that observers such as graduate students in psychology, nurses and medical students are unable to differentiate and name the emotions as exhibited in motion pictures or by direct observation of infants. When the observers were shown the responses but not the stimuli they showed more disagreement than agreement in their identification of the response patterns. Nine different emotions were reported for four responses. Hunger was judged as anger, fear, pain and hunger, and pain was judged as anger and fear, each about three times more frequently than pain. Anger likewise was judged as fear, pain, hunger and anger.

As a matter of fact other investigators have been unable to verify Watson's observations.

Several investigators have found that when the infant is severely hampered, he goes to sleep; another reports when an infant is suddenly raised in the air that the reaction is similar to that which appears upon being dropped. In this situation very little crying appears. It is concluded that the reaction is a labyrinthine response to acceleration in space and is not an emotional reaction. Slow-motion pictures reveal that a baby may be repeatedly dropped without including crying. Nor are loud revolver shots followed by fear and by crying in a majority of infants.

When Watson's experiments were repeated in an experiment meticulously using his own techniques, an analysis of the data revealed that responses were not significantly differentiated according to various situations. On the contrary the data failed to disclose any pattern responses corresponding exclusively to the four stimulating conditions employed.

Bridges has outlined an approach to the question of the primary emotions and their development during the period of infancy. This approach was based upon personal observations and the findings and theories of other workers. According to this view, there is one primary emotion to be identified as general excitement. A strong or sudden stimulus creates in the young infant at first a generalized disturbance. It is difficult in this situation to discriminate whether a baby is frightened, angry or pleasantly excited. As the child develops, excitement increasingly becomes differentiated into two general types of emotions. One of these may be called distress and perhaps should include what Watson called fear and rage; the other is delight and may be the same as that designated by Watson as love. This is a genetic theory assuming that there is an undifferentiated emotion becoming differentiated and associated with certain situations and motor responses to form the separate emotions which in turn become differentiated. Thus distress becomes modified into fear and anger, and delight into joy and affection. No specific assumptions are made regarding an exact time for the appearance of these reactions but by the end of the second year general excitement has become differentiated into fear, anger, distress, disgust, jealousy, excitement, delight, joy and affection.

It has been found by means of conditioning techniques that the infant's emotions may be

modified. A hospitalized child of eleven months named Albert was tested with a rat, a rabbit, a dog, a monkey, also with masks, cotton, and wool to determine whether fear responses were called out. In none of these tests did fear reactions appear. Then a rat was presented and a steel bar was struck with the hammer immediately behind the child's head. The procedure was repeated and subsequently other objects were shown with reinforcement. Marked fear and flight reaction, puckered lips, trembling and crying were successfully conditioned.

That fears may be eliminated was demonstrated by the case of Peter, who was afraid of furry animals such as the rabbit, the rat, fur coats and of feathers. By associating a pleasant stimulus, candy, with a negative one, a rabbit, the fear pattern became unconditioned.

Emotional responses in infants are not correlated to any specific stimuli but rather to certain specific aspects of stimuli effective in evoking response patterns. These specific aspects are intensity, duration of the stimulus and suddenness of presentation. Most workers now hold that in the neonate there are no specific response patterns. It is customary to use crying as an index of emotionality but crying may appear in conjunction with generalized behavior and seldom by itself. Smiling has been studied in reference to the pleasant emotions. Most workers agree that it appears at about the age of two months and laughter appears later. Little can be said about the visceral components of the infant's emotional reactions and since language is absent nothing about the subjective aspects of the problem is available.

The problem of the emotions of infants, then, is not in a very satisfactory state. The criteria must be in terms of objective patterns and the stimuli which elude them, and this has not yet been completely worked out. It seems probable that further exploitation of Bridges' approach to emotional development may lead to a better understanding of how these behavior patterns develop.

MENTAL DEVELOPMENT

A number of tests and scales have been devised for the purpose of measuring the development of the infant. Among the more prominent ones are those by the following: Gesell, Buehler, Bayley, Kuhlman, Linfert and Hierholzer, Fillmore, Cattell.

The purpose of these efforts has been to measure the development of the child during the first two or two and a half years of life in order that (1) an estimate of its developmental status at a given time may be made, and (2) its future mental status may be predicted.

The Gesell schedules of development represent the most comprehensive attempt to inventory behavior items during the period of infancy. The specific behavior items were collected at the Yale Psycho Clinic and grouped into four categories: (1) motor, items which relate to muscular capacity and coordination; (2) language, items which include vocalization, speech, and auditory comprehension; (3) personal-social, items which involve social experience and personality traits; and (4) adaptive behavior, items which concern ability to exploit the environment and imposed situations.

These normative schedules are clinical instruments; they are not standardized tests. For their clinical purposes they are extremely important. Moreover, they are the main source of behavior items from which more recent tests have been constructed.

Another prominent attempt to measure infant development is by B  bler. Her tests are samplings of behavior from four main lines of action: (1) bodily control, (2) mental ability, (3) social development, (4) manipulation of objects. Although the behavior items are similar to those of the Gesell schedules a much more systematic attempt was made in the construction of the test. It is intended to give a cross-section of the child's personality at each stage of development. The results are expressed in developmental quotients which may be presented in a profile which shows the relative development in sense reception, bodily control, manipulation, learning, social reactions, and mental production. The items were placed at a point where 66 per cent of the infants succeeded.

Quite early Kuhlman attempted to extend the Binet scales to the three-month age. This is a standardized test and considerable thought and practice have gone into Kuhlman's work. He has subjected his tests to a number of revisions. Items were placed at a level at which 50 per cent of the children passed. The scores may be read either as mental units on the Heineis curve of mental growth or as intelligence quotients.

The Linfert-Hierholzer scale consists of two

parts, one for infants of one, two and four months, the other for infants between six and twelve months. It is not divided into age group tests; accordingly a six months infant is given all the tests in the second series, and so on.

The most recent and what promises to be perhaps the most useful instrument for measuring the development of infants is the Cattell tests of intelligence which include tests for each month from the second to the twelfth months and tests on the even months from the fourteenth to the thirtieth months. This scale is integrated with the low end of Form L of the Stanford-Binet scale. Included in each month's lists of items are a group of alternate items which make it an adequate scale so far as numbers of items is concerned.

Other scales which may be mentioned have been constructed by Fillmore, Bayley, Richards, Shirley, Shotwell and Gilliland.

There is the problem as to whether these items are really tests of intelligence of infants or tests of general development during the first two years of life. It is indeed a question as to whether young infants exhibit intelligent behavior at all. A conservative view is that these instruments as fashioned at present do not possess reliable predictive ability and yield merely estimates of developmental status.

SENSORY ABILITIES

Vision. The eye of the newborn is a somewhat different sense organ than that of the adult. Throughout the early months of life it continues to undergo changes in shape and growth. The cornea and lens become less curved, the length of the eyeball increases in relation to width, rods and cones in the retina increase tremendously in number, the former becoming deeper and better placed. Papillary action is slower than in adults and the external muscles are not too well coordinated. The optic nerve at first is not completely myelinated, nor are the connections from the visual centers of the midbrain to the visual cortical areas mature at birth. However, visual purple is known to be present in the retinas of prematurely born infants. There is general agreement among investigators that newborn infants respond to visual stimulation. The main problem concerns the determination of the kinds and degrees of discrimination present.

Young infants respond to lights of varying

intensity. The pupillary response is a function of intensity and increases in rate with age. The palpebral response and head retraction are elicited by a sudden onset of light and there also are changes in respiration and circulation. The Moro reflex may be evoked by a sudden strong light. Convergence of the eyes resulting in fixation has been observed in newborns but strabismus continues into the second month. Another criterion of the effect of light is the amount of body activity present under varying intensities. It has been found in a series of experiments that as intensities vary from .002 foot candles to 50 foot candles there is increased inhibition of activity. It has been demonstrated that the sensitivity of the infant eye is increased by dark adaptation.

Pursuit movements of head and eyes to a slowly moving light may be observed during the neonatal period. When a rotating visual field was used to evoke pursuit movements, they were found to be increasingly present after the second week of life. In this situation optic nystagmus was observed a few hours after birth. Response to the horizontal and vertical movement of a ring is placed in a scale of mental development at two months. The same test places the following of a ring in circular movement at three months and of a ball rolled across the table at four months. Visual acuity is a factor in pursuit movements and thus is indicated in the previous remarks, although the fineness of this ability has not been demonstrated in young infants. The effect of flicker has not been systematically studied in infants.

Some work has been done on the ability of infants to discriminate form. It has been found that a fifteen-month infant can learn to discriminate between a triangle and a circle, and between a cross and a square. Form board discrimination has been demonstrated in children under two years of age by means of a conditioning technique. The forms were blocks in the shape of a lozenge, a square, a circle and a maltese cross. The reward was a cookie placed under the block.

The appearance of the phenomenon of size constancy has been investigated in terms of the infant's differential reacting movements. It was found that six-month infants begin to reach for objects according to their actual rather than their retinal size.

There is disagreement among investigators

concerning the degree of ability of newborns under ten days of life to discriminate the various hues. There is evidence, however, that they respond differentially in amount of body activity under lights at the two ends of the spectrum. Blue has been found to have a greater effect in inhibiting body activity and crying than red or green light. The effect of red light is not much different than the influence of darkness. If the inhibiting effect of blue is taken as 100, then green light has a relative brightness value of 60, and red of 46. Girls seem to be better discriminators than boys. Whether the Purkinje phenomenon is present is a controversial matter.

The conditioning method has been used to approach the problem of color vision in the early months of life. Yellow and red electric bulbs have been each paired with a bottle of milk as the unconditioned stimulus. The age of six subjects at the beginning of one experiment ranged from two weeks to a month and a half. Interestingly, the age at the formation of the simple conditioned response to colored light for the youngest and the oldest infant was the same, one month and twenty-nine days. The youngest child required 200 pairings to establish the response, and the oldest only 49. This suggests that age is an important factor in establishing simple conditioned responses to hue during early infancy. Differentiation between green and yellow, and green and red was not established until the fourth month of life.

Another method employed in investigating the hue sensitivity of infants consists in observing eye movements in response to a spot of colored light which is moved across a gray area of the same brightness as the colored spot. Infants up to seventy days showed pursuit movements in from 90 to 100 per cent of the presentations.

A preference method has also been used successfully with infants under two years. Subjects from two to five months differentiate colored from colorless light, and those from five to twenty-four months, in addition, show a greater preference for red and yellow over gray than for green and red over gray. When red-yellow, red-green, red-blue, yellow-green, yellow-blue, and green-blue were equated for brightness and presented to infants ranging in age from six to twenty-four months, the preferences were in the order of red, yellow, blue, and green.

Two-year infants are able to match colors

with an accuracy of 45 per cent, and to name colors with an accuracy of 25 per cent.

Audition. The problem of the auditory sensitivity of the newborn infant has been subject to a considerable amount of controversy. The reasons for doubting the existence of this ability revolve about the following matters: the tympanic membrane is at an angle at which sound vibrations are inadequately effective, the external meatus of the ear is filled with glandular secretions, the ossicles are too rigid for functioning, the auditory nerve is imperfectly developed. The view most generally held at present, however, is that the infant does hear at least within a few days after birth. There is an accumulation of evidence in support of this position.

The problems of audition may be considered under several headings: intensity, duration, pitch, complexity, noise and pure tones, discontinuous sounds. The systematic exploitation of the auditory capacities of infants has had little application of scientific controls, adequate calibration of stimuli and of instrumental recording until recently. It has long been known that young infants respond to loud sudden noises by means of the body jerk or startle. A considerable array of noise stimuli have been used to elicit reactions. They include a pistol shot, the banging of doors, a hammer striking a metal bar or tin can, the rustling of paper, wooden snappers, whistling sounds, an adult's voice, hand clapping, etc. Criteria of auditory response include the Moro reflex, eye-blinking, pupillary dilation, respiratory gasp, disturbed respiration, the fontanelle response, crying, and the amount of body activity.

Although newborn infants respond to loud sudden noises, it has not been demonstrated that they discriminate pitches. Careful work employing tones of 128, 256, 1024, and 4096 cycles and stabilimeter recording found no discrimination in babies under ten days of age. When the problem of pitch discrimination was investigated by means of a conditioning procedure it was found that differential sucking reactions to tones two octaves apart could be established toward the end of the second month and the beginning of the third month. Little work has been done and consequently little is known about the ability of the young infants to respond to complex auditory stimuli.

The newborn responds to increases in the

intensity of sounds. It has been established that they discriminate large differences of intensities. Thus they respond differentially to intensities of 30 and 70 decibels, and to 30 and 85 decibels with frequency and duration controlled. Finer discriminations such as 30 and 50, 50 and 70, and 70 and 85 decibels are not reliably discriminated.

Newborn infants respond differentially to brief durations of sound when frequency and intensity are controlled. With increase of duration there is a higher per cent of response but the increment is a diminishing one. Thus there is an increase in response with durations varying from 1 to 3, to 5, to 15 seconds. On the other hand, when the durations of sounds are of a larger order such as five or six minutes, an inhibiting effect in body activity is produced.

Discontinuous, repeated auditory stimuli produce rapid decrements in circulatory and respiratory responses. A similar result has been found when the criterion was in terms of activity. The response decreases with successive repetitions of the stimuli and the amount of activity per stimulation decreases as their frequency is increased within a given period.

The reaction time of the body startle to a stimulus of 581 cycles, and a duration of .07" with a constant intensity is $.18'' \pm .03$. The reaction time of the respiratory gasp to sound is $.09'' \pm .03$.

In summary, the young infant is not deaf. His auditory discriminatory ability, however, is limited to intensity and time factors. It does not discriminate pitches probably until late infancy, nor are its differential responses to the complex character of sounds developed.

Taction. The horny layer of the skin of the newborn infant is thin, the dermis is very cellular, the elastic tissue of the skin is feebly developed. The subcutaneous cellular tissue is well formed and sebaceous and sweat glands are not yet fully developed. Pacini corpuscles are well developed. In adult epidermis a graded series of cutaneous organs ranging from highly capsulated Vater-Pacini cells to diffuse nerve endings are present. In the epidermis of newborns Pacini cells are found.

Areas upon the infant's body surface which have been stimulated include the face, the trunk, the limbs, especially the palmar and plantar surfaces, and external body cavities such as the mouth and the nose. A large variety of

stimulations have been employed. Some of these are pin pricks, punctiform and general pressure, deep pressures, electrotactile stimulation, stroking, warm and cold applications. For these purposes a number of instrumental stimulating devices have been used with infants. Aesthesiometers have been employed and thermal devices such as cylinders and capsules through which water at various temperatures may be passed. Electrodes and itch powders have also been used. Some of these instruments have been calibrated; others have been used only for gross observational purposes.

For criteria by which to judge the effectiveness of cutaneous stimulation workers have made use of such responses as movements of the head and limbs, flexion, extension, grasping, plantar reflexes, the amount of body activity, sucking and mouth movements, amount of crying, respiration, fontanelle pressure and the galvanic response.

There is evidence to show that the tongue of the newborn infant is highly sensitive to touch but that the lip and mucous membrane of the nose are the most sensitive of the cutaneous areas. The palmar and plantar areas also are quite sensitive to pressure. There is diminished responsiveness to punctiform pressure on the face from the mouth region across the cheek to the area in front of the ear. The breast, shoulders, abdomen and back are least sensitive surfaces of the body.

There is a very extensive literature on the effect of plantar stimulation. It has been asserted quite frequently that stimulation of the sole of the young infant's foot evokes the Babinski reflex. However, carefully conducted studies using a variety of pressures upon various parts of the plantar surface of infants from birth to four years indicates that great toe extension is not the only response which appears, nor is it the most typical one. There is first of all great difficulty in reaching general agreement as to what constitutes "typicalness" in view of the fact that many mixed types of responses are present. As the child grows older there emerges a more definite toe response, tending slightly at first to be of the extensor character and eventually, at from six to eighteen months, of flexor character as well. Gradually all reactivity appears to decrease until at four or five years it has become negligible, and the characteristic result of plantar stimulation is the elicitation of

no response whatever. Attention may be called to the fact that stimulation of the upper surface of the foot evokes the same types of movements of toe and foot as does that of stimulation of the plantar surface.

Differentiation of contact or light pressure from other types of stimulation such as thermal, pain, gustatory is difficult. Moreover, the criterion for distinguishing light and deep pressure is especially difficult. Consequently much of the work with tactile stimuli is confused because pressures begin to arouse deep sensitivity. It has been found that pressure upon the skin of the baby will arouse a defense reaction of the arms and it has been asserted that if the flesh of the infant's leg is "clamped" localizing movements in the other foot will occur. On the other hand it has been found that during the first two weeks there is no response to a commercial itch powder composed of small plant hairs although with age increased body activity takes place. During the first six months there is no localized scratching in response to this type of stimulation.

Palmar contact with a rod or a pencil has been studied. Deep pressure or proprioceptive effects of course are involved. It has been noted that the neonatal grasping reflex has two phases. One is closure to light pressure upon the palm, which disappears in the period from sixteen to twenty-four weeks, and gripping which disappears after twenty-four weeks. The strength of the young baby's grip has been stated in terms of the length of time it can suspend its weight by its hands. The time is said to vary from a few seconds to two and a half minutes. When a dynamometer was used to measure the strength of the grasp it was found that the maximum strength of the strongest subject was 2200 g.

The development of prehensile activities of infants has been systematically studied. It has been found that in reaching for an object such as a cube or pellet the earliest approach is a back-hand movement in which the hand sweeps out and forward; the next type of approach is a circuitous movement which appears in about twenty-four weeks. Finally a direct and vertical approach is made to grasp the object. Grasping at first is clawlike in which none of the digits predominate. Later a nipping pattern of thumb and forefinger appears which involves precise placement of the digit upon the object.

The presence of electrodermal effects in young infants has been demonstrated. Average skin

resistance (palmar) for adults is 23,600 ohms; for the neonate it is 273,000 ohms. However, another study showed that plantar and palmar resistance in newborns is in general only slightly higher than in adults. Increase in skin resistance in infants is related to muscular reaction and decrease is related to increased phasic and tonic muscular activities. Skin resistance cannot be used, as is sometimes thought, as a criterion of sleep in infants. Latent times of the respiratory gasp and leg withdrawal to electric shock have been found to be highly variable.

There is disagreement as to the degree of sensitivity of newborns to pain stimulation. This has probably been due to the fact that results with various cutaneous areas differ as well as to the fact that the problem has not been too systematically exploited. Pain sensitivity has been investigated by means of needle pricks, the criterion of which is usually a withdrawal response. Depth of penetration may or may not be controlled. A study which employed a single needle jab with one-sixteenth inch maximum penetration reports that arm areas are more sensitive than head areas and that leg areas are most sensitive. Another study using repeated needle jabs found that head areas are more sensitive than leg areas. Pain sensitivity increases with age. It has been found that an average of 6.5 needle jabs in head areas are required to evoke a response on the first day of life, while from thirty-six to forty hours after birth 1.7 jabs evoked the response, with one stimulation sufficing after forty-one hours. The sensitivity of leg areas increases with age. This is shown by the fact that from the fifth to the seventy-fifth hours the number of stimulations necessary to produce a response decreases from ten to two, while thereafter only one stimulation is necessary. The reaction time to a needle jab upon the volar surface of the arm ranges from 0.12 to 0.70 second. The reaction time to stimulation of the plantar surface of the foot has been reported to be about two seconds.

Infants react to cold and warmth. Limited areal but not punctiform stimulation has been employed as well as general environmental stimulation. Cold, applied by means of capsules to the forehead, results in prompt and vigorous changes in respiration and fontanelle pressure. When a temperature cylinder is used on the forehead over an area of 50 sq. mm. with an average temperature of 11°-12° C., infants re-

spond in 73 per cent of the stimulations. Water filled glass tubes applied to the cheeks at 15° C. were effective 96 per cent of the time, and at 45° C. in 89 per cent of the time. However, these temperatures when applied to palmar surfaces evoked no responses in 74 per cent of the stimulations. The application of the temperature cylinder to the inner surface of the knee induced reaction to 91 per cent of the stimulations. The plantar surface is very sensitive. It has been shown that 94 per cent of response to stimulation of this area follows stimuli of about 45° C., and 100 per cent follows those of about 15° C. The oral cavity of newborns is sensitive to thermal stimuli. Responses are elicited at temperatures from 8° to 53° C. Infants will respond with sucking movements to milk at various temperatures.

General body activity is negatively correlated with temperatures within a range of 74° to 88° F., although temperatures of greater range than this are known to have profound physiological effects. Comparisons of thermal effects of young and old infants are not available.

Taste. As in the case of odor, taste sensitivity is relatively undeveloped in the early post-natal period. It is doubtful that newborns can definitely discriminate the four qualities of sweet, sour, salt, and bitter.

Methods of stimulation are the use of applicator sticks, nipples, and special nursing bottles. Stimuli used are substances in solution such as salt, sugar, quinine, acid. Controls such as mother's milk, air, or distilled water have occasionally been employed. Temperature may or may not be controlled. Little has been done to explore the sensitivity of various mouth and tongue regions of the infant. As a rule application of the stimuli has been areal rather than punctiform. Responses which have been selected as criteria of the effectiveness of the stimuli include sucking, mimetic responses, rejection of the stimulating device, crying, general body activity, respiratory and circulatory effects.

There is little discrimination of taste stimuli by young infants. When the per cent of responses to distilled water is subtracted from the per cent of responses to each of the substances the differences have not been found to be significant. There are irregular respiratory and fontanelle reactions to sour and bitter but no evidence of a discriminatory nature. Sweet stimuli seem to calm the infant. Sucking re-

sponses to sugar increase with age and an increase of mimetic responses to salt, sour and bitter seem to become more evident as the infant grows older. Salt, sugar, citric acid, quinine and water stimulations by means of applicator sticks do not evoke significant differential responses, although quinine and citric acid seem to be somewhat more effective than salt and sugar. When sucking is used as a criterion, salt solution and mother's milk produce differences in response.

Odor. There is lack of agreement concerning the olfactory ability of the newborn child. The problem is further complicated by the probability that with strong stimuli pain is a factor in the response to odors. Thus it seems certain that infants react to stimuli such as acetic acid and ammonia but it is doubtful whether the reaction is to odor as such or to pain.

For stimulation, solutions saturated in various degrees of acetic acid, ammonia, oil of cloves, valerian, violets, asafoetida, citronella, turpentine, pyridine, lemon and others are used. In the better experiments pure air serves as a control. The solutions are drawn into a syringe, carried to the nostrils of the infant and released. Responses which serve as the criterion of the effect of these stimuli are turning the head from the stimulus, throwing back the head, sucking, amount of body activity, grimacing, crying, respiration, fontanelle pressure.

It is highly probable that odor sensitivity is the least developed of the newborn's sense modes. The work in this field, moreover, is characterized by a dearth of good experiments.

There are only a few workers who have attempted to compare reactions to odors with those to pure air. Few controls such as of room temperatures have been made. Only one study has attempted to relate odor reactions to stimuli organized on the principle of Herring's odor pyramid. Reactions to ammonia and acetic acid are more prominent than to other substances. Although most solutions will evoke responses the same kind of movements follow each stimulus. There are no conclusive results regarding age and sex differences. Differences in percentages of response may be due to the intensity factor. Nothing in the data supports or refutes Herring's sixfold classification of odors.

Posture. The workers in this field of infant reactions distinguish between body control of the baby during rest and during movement.

The reflexes on which body posture and equilibrium during reclining, standing, and sitting depend are called static or postural reflexes. Positional responses are grouped into standing and righting reflexes. They are tonic in nature. Sense organs involved in these responses are proprioceptive, pressure receptors of the skin, the eyes, and the otoliths. Kinetic responses follow upon active and passive movements of the body, and are mechanisms which readjust the body after displacement. They are phasic rather than tonic; they proceed with comparative rapidity. Upon their cessation the body is again controlled by the static reflexes. The receptor organs involved are the semicircular canals. Some of these reactions have been studied in young infants.

The technique of stimulation in the case of the static or tonic responses includes rotating the head, bowing the head ventrally, head rotation with the chest either held or free, rotation of the pelvis with the chest either held or free, and inverted suspension. Kinetic reactions are evoked either by direct shaking of the head or by indirect head shaking as in tipping the infant and lifting him. In addition compounded stimulation of labyrinthine, proprioceptive, and visual receptors have been studied.

One of the most striking of the static postures of infants is the tonic neck reflex acting on the limbs. If the head is rotated so that the face is directed to the right shoulder, the right arm and leg will extend and the left limbs will flex. This response, however, is not invariable, nor will it when present always be as clean-cut as the description implies, for it may be disturbed by phasic or labyrinthine factors. It is present during the first three months of life. The Brudinski phenomenon is evoked in the supine position by ventral bending of the head. It consists in a drawing up and flexion of the legs. It has been reported as present during the first month but there is disagreement on this point.

Opisthotonos is another striking static posture in normal healthy infants. This reaction may be observed during the first half year of life. It can be evoked by grasping the infant above the knees and suspending it in an inverted position. During the first ten days momentarily maintained backward bending of the head occurs. Tonic flexion is the dominant posture of the arms. During the first quarter year

of life the reaction becomes more pronounced. During the second quarter year the most characteristic aspect is that the bending includes the lumbar region of the vertebral axis, but now the arms frequently go into a tonic forward extension. There is little struggling or crying during the first six months. Opisthotonos disappears about the seventh month and is replaced by forward bending at the waist and neck and is accompanied by crying. This unusual pattern is characteristic of normal infants and probably involves both proprioceptive and labyrinthine factors.

There is a tonic neck reflex acting on the trunk. If the infant is placed on its back and the head rotated to the side, the whole body follows the rotation. But if the thorax is held fixed, the pelvis will move in the opposite direction. This effect has been observed throughout the first year and for two and one-half years in idiots. If the thorax is held while the pelvis is rotated, the head will make a compensatory movement. This reaction is much less frequent.

In young infants held in a sitting posture a sudden flash of light is responded to by a backward jerk of the head, a posture which is maintained as long as the light continues.

If an infant is suspended in the supine position its body assumes a crescent shape with the head and legs up and the arms raised sidewise about horizontally with palms down. If now the head is pushed down the pelvic muscles will relax and the legs will hang down. Both proprioceptive and labyrinthine influences play a part in these reactions.

The above are a few simple instances of the effect of proprioceptive stimulation involved in various body postures of infants.

MOTOR REACTIONS

In this summary it is impossible to describe in detail the total array of reflexes which have been observed in the motor equipment of babies. Many have been indicated in the body of this article. In concluding the treatment of the behavior of the infant, the development of the more complex motor patterns will be described.

The studies in the area of research may be classed as normative, in which the mean age and range of appearance of a given activity is stated, and experimental, in which a given pattern is studied in terms of experimental and

control groups or individuals. A very brief outline of a few motor activities follows.

At one month the child lifts the head, retains hold of a large ring; at two months it carries an object to the mouth and turns head and eyes to a moving object or light. At four months the head is held erect when the child is carried, closes its hand on a dangling ring and opposes thumb to other fingers. At six months it sits momentarily, reaches for an object, rolls over, and drinks from a cup. At nine months it sits alone, rises to a standing position with aid of a chair, creeps, walks with help, and waves bye-bye. At a year it may walk with frequent falls, unwrap paper from a small object, put cork in a bottle and accept a third cube. At fifteen months it walks fairly well but with a wide foot stance, marks with a pencil, takes objects from a box, and places several pegs in a board. At eighteen months it will throw a ball, scribble, climb stairs, drink from a glass, point to eyes, nose or ear. At two years it runs, imitates vertical and horizontal strokes with a pencil, nests small boxes, tries to make a circle, piles blocks and points out objects in a picture. These normative items do not exhaust its complete motor equipment, however.

These norms do not correlate highly with intelligence test scores in the post-infant period. Their utility for predictive purposes therefore is still in doubt.

The period of infancy is characterized by three patterns of locomotion: crawling, creeping and walking. Crawling is defined as progress with the abdomen resting upon the sustaining surface. Creeping is quadrupedal progress with the abdomen lifted from the surface. Walking is erect or bipedal locomotion. The literature is replete with studies concerning the mechanics of these modes of progress.

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INTELLIGENCE TEST STANDARDIZATION.

I. INTRODUCTION AND HISTORY

When the labors of test construction are completed, an author is confronted with the aphorism ". . . that whatever the intrinsic merits of an intelligence scale, its diagnostic value must, to a large extent, depend on the degree to which the characteristics of the originally tested groups will approximate those of the general population to whom the tests will be subsequently administered."¹ What this adds up to in practice is whether the standardizing population is a random sampling of the population. The population of our nation is of such a diverse nature that a test to have national application must deal with, as fairly as possible, proletarian, suburbanite, and farmer, urban and rural, poor and rich, northerner, southerner, mechanic and banker, or illiterate and collegian. The history of test standardization is a growing awareness of these factors and their increasing incorporation into standardization procedure.

The father of mental testing, Binet, was the

first to stub his toe on this ubiquitous rock. His final scale—in collaboration with Simon in 1911, shortly before his untimely death—in the words of Terman was ". . . decidedly too easy in the lower ranges, and too difficult in the upper. As a result, the average child of five years was caused to test at not far from six years, the average child of twelve years not far from eleven."² Undoubtedly this was due to gross errors in selecting his population to conform to national standards. The criticism having been made, the author attempted to remedy the defect by extensive testing in a more controlled situation. Terman's 1916 revision was based on 1,000 children below the age of fourteen who were tested in a school of average communities which all or nearly all of the students attended, while the portions of the testing that were intended to measure individuals above fourteen were standardized on 30 business men, 150 migrating unemployed, 150 adolescent delinquents, and 50 high school students.

With the coming of World War I, psychological techniques were introduced into the U. S. Army to rapidly classify men. These resulted in the involvement of the famed Alpha and Beta Tests and the Army Performance Test. While the tests were standardized on large groups from the army population, plus feeble-minded and students in colleges, no attempt seems to have been made to assess this population in terms of the national standards. It is not surprising, therefore, that in the general draft population during 1917 and 1918, no less than 47.9 per cent were rated below C Average, and this in a group already sifted for mental defectives. The Army Performance Scale was standardized on 260 adults and was approximately as accurate. This was better, however, than the 1916 Stanford-Binet, which would have classified 34 per cent of the white draft—the flower of American manhood—below I. Q. 75, i.e., feeble-minded.

With the ending of the war, interest in the testing of children was again revived, while the Alpha and the Beta were adopted as standard adult tests throughout the country. Typical of the newer types of standardization was Goode-nough's, used with her Measurement of Intelligence by Drawing Test, in which a careful attempt was made to have the children used in standardization approximate what was considered to be age-grade standards for the nation;

although there existed no way in which these national standards could be ascertained and local figures had to be interpolated as an estimate. Considering the lack of information, the attempt was a distinct step forward, as the accompanying table illustrates (Table I). Meanwhile, other test authors disregarded standardiz-

ing populations almost entirely and based their norms upon statistical data derived from such methods as bisecting the regression lines when the Pearson r was calculated for a correlation between the new test and the 1916 Stanford Binet. An example of this type is the Revised Beta of Kellogg and Morton in 1930.

TABLE I
GOODENOUGH AND CENSUS AGE GRADE DISTRIBUTION COMPARED *
(In Per Cent of Each Age)

Grade	5		6		7		8		9		10	
	G.	U.S.	G.	U.S.	G.	U.S.	G.	U.S.	G.	U.S.	G.	U.S.
0	100	95.4	100	64.6	77.1	100	3.8	1.4	6.8	100	68.3	.8
1		4.5		33.6								
2 .....		.1		11.7								
3 .....				.1	20.6	18.9	1.9	2.0	17.8	71.6	100	.3
4												
5												
6 .....					.1	.1	.1	.1	.1	.1	.1	.1
7												
8												
9												

* The Goodenough Data are calculated from Goodenough, Florence L., *The Measurement of Intelligence by Drawings*, World Book Company, Chicago, 1926, p. 38, Table 2. The United States Census Data are discussed more fully in a succeeding table. In certain cases the data had to be combined into two grades. This is due to the peculiar form of the data as presented in the Goodenough statistics.

G = Goodenough Percentages

U.S. = U. S. Census Percentages for 1940.

While the internal construction of tests continued to be refined, little was done to improve the standardizing population until the two individual tests that are now predominant were issued: the 1937 Stanford-Binet and the Wechsler-Bellevue. It must be pointed out, however, that some movement in that direction was made by several pre-school tests. The Merrill-Palmer Scale of 1931 was standardized on 631 children representative of the *Detroit areas* which, while very accurate for that particular region, is certainly not representative of the population of the U. S.; while this same criticism can be leveled at the Minnesota Pre-School Test, standardized on data representative of the

city of Minneapolis. In the same connection it should be pointed out that such famous standards as Gesell's are strictly applicable to infants from homes of middle socio-economic status, with parents of northern European extraction.

The 1937 Stanford-Binet made a serious and concerted attempt to master the problem. Schools of average social status were selected in each community, and the communities were carefully chosen to compensate for such factors as age-grade relationship and socio-economic status of the parents. The pre-school children, and those out of school in the higher grade brackets, were also evaluated in the same way.

The 1930 Census was used to evaluate the socio-economic status with serious discrepancies in groups III and VII (Table II). The age-grade distribution could not be evaluated at that time since no national criterion was available, but Table III illustrates the comparison with the 1940 Census data. It must be noted that, al-

though the test purported to measure adult intelligence, no adults were used in standardization. With this test the principle of compensating for the gradual slowing up of intelligence during adolescence in contrast to the relentless march of chronological age is fully compensated.

TABLE II

COMPARISON OF 1937 BINET AND 1930 CENSUS SOCIO-ECONOMIC DIVISIONS *

Occupational Group	1930 Census Percentages	1937 Binet Percentages of Living Fathers
I. Professional	3.1	4.5
II. Semi-Professional and Managerial	5.2	7.8
III. Clerical, Skilled Trades and Retail Business	15.0	25.5
IV. Farmers	15.3	14.9
V. Semi-Skilled Occupations, Minor Clerical Positions, and Minor Businesses	30.6	31.4
VI. Slightly Skilled Trades	11.3	9.4
VII. Day Laborers (urban and rural)	19.5	6.6

* Terman, Lewis M., and Merrill, Maud A., *Measuring Intelligence*, Houghton Mifflin Co., Boston, 1937, p. 14.

The Wechsler-Bellevue Test is divided into a youth scale and an adult scale, each of which was separately standardized. The adult scale was equated against the national population of the U. S. by using the broad occupational classes of the 1930 Census, substituting for the 20 per cent of this group that should have been employed in agriculture; bankers, bakers, and teamsters as equivalent. Similar substituting was used for other smaller classifications. Men seemed to be well covered, but 55 to 90 per cent of each female age group was composed of "not gainfully employed." The youth scale was based on the age-grade distribution of the New York City schools, which are contrasted with the standards for a similar white group from the U. S. Census in Table IV. As Table V illustrates, the means and S. D.'s of each age group had to be smoothed, some markedly, in order to achieve a usable curve of growth and decline in intelligence with increasing age. Wechsler's test, however, was the first to compensate

for declining performance with age, thus releasing the average adult from the limbo of subnormal intelligence into which all previous tests had consigned him.

The Lewisburg Beta was the first test to be standardized on the basis of the 1940 Census data, released in 1943. Standardized for adults, the validating population is "meticulously sampled and matched" to conform to the 1940 Census standards for white adults with the criteria of grade completed and socio-economic status. As a result of the use of these data, and the rigorous conformation of the standardizing population to it, the means and the S. D.'s of the five year age-groups from 20 to 54 were regular enough to preclude smoothing and are contrasted with the similar Wechsler-Bellevue data in Table VI and Graph I. The use of adult prisoners as the standardizing group, however, may conceivably have reintroduced a minor sampling error.

TABLE III
AGE GRADE STANDARDS OF THE 1937 BINET AS CONTRASTED WITH CENSUS NORMS •
Last School Grade Completed in Percentage

Age	0		1		2		3		4		5		6		7		8		9		10		11		12	
	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.	B.	C.
5-5	99.8	95.4	.2	4.5																						
6-5	77.2	64.6	22.6	33.6	.2	1.7	.1																			
7-5	32.4	19.3	51.5	57.8	16.1	20.6	1.9				.1															
8-5	5.5	3.8	34.6	26.4	39.4	48.4	20.1	18.9	.5	2.0	.2															
9-5 .....	.5	1.4	6.2	6.8	29.8	26.8	44.6	44.8	18.5	17.8	.5	2.1														
10-5 .....	.8		1.0	2.4	7.7	8.9	31.1	26.7	41.3	41.6	18.2	16.7	.8	2.3												
11-5 .....	.6		.5	1.0	2.0	3.4	9.6	9.9	31.0	26.2	39.3	39.8	16.5	16.4	1.3	2.1	.1									
12-5 .....	.6		.3	.6	.5	.7	3.7	4.5	9.6	10.8	30.0	25.2	37.9	37.6	15.8	15.6	2.2	2.6								
13-5 .....	.5		.4	.4	.4	.9	1.3	2.2	2.0	5.1	11.3	10.9	31.3	24.6	40.3	36.2	12.1	15.4	1.3	3.4	.6					
14-5 .....	.5			.3		.6	.5	1.3	.5	2.7	3.0	5.3	12.0	11.4	37.5	23.7	28.6	33.8	14.4	17.0	2.4	2.9	.4			

• Terman, Lewis M., and Merrill, Maud., *Measuring Intelligence*, Houghton Mifflin, Boston, 1937, p. 17, and also see Table X.
B = 1937 Binet Sampling.
C = Census Norms.

TABLE IV
AGE GRADE STANDARDS OF THE WECHSLER-BELLEVUE POPULATION AS CONTRASTED WITH CENSUS NORMS •
Last School Grade Completed in Percentage

Age	W. C.	Ungraded	W. C.	1	W. C.	2	W. C.	3	W. C.	4	W. C.	5	W. C.	6	W. C.	7	W. C.	8	W. C.	9	W. C.	10	W. C.	11	W. C.	12	Continuation
7...	10	19.3	80	57.8	10	20.6	1.9	1.9	2.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
8...	2	3.8	26	26.4	62	48.4	10	18.9	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
9...	1.4	2.0	2.0	6.8	14	26.8	74	44.8	8	17.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
10...	.8	3.3	3.3	2.4	3.3	8.9	15	26.7	55	41.6	21.7	16.7	1.7	2.3	3	3	3	3	3	3	3	3	3	3	3	3	3
11...	.6	1.7	1.7	1.0	1.7	3.4	5.0	9.9	23.3	26.2	46.7	39.8	18.3	16.4	1.7	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
12...	.5	1.7	1.7	.6	1.7	1.7	1.7	4.5	5.0	10.8	28.3	25.2	31.7	37.6	30.0	15.6	1.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
13...	.5	1.4	.4	.4	.4	.9	2.2	1.4	1.4	5.1	7.1	10.9	15.7	24.6	42.9	36.2	28.6	15.4	2.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
14...	.5	1.4	1.4	.3	.3	.6	1.3	1.3	1.4	2.7	2.9	5.3	2.9	11.4	17.1	23.7	48.6	33.8	18.6	17.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9

• Wechsler, David, *The Measurement of Adult Intelligence*, The Williams & Wilkins Co., Baltimore, 1941, p. 116, and also see Table X.
W = Wechsler-Bellevue Sampling.

C = Census Norms.

TABLE V
WECHSLER-BELLEVUE MEAN STANDARD SCORES AND SIGMAS*

Age	Full Scale			Verbal Scale			Performance Scale					
	raw mean	smoothed mean	raw sigma	smoothed sigma	raw mean	smoothed mean	raw sigma	smoothed sigma	raw mean	smoothed mean	raw sigma	smoothed sigma
7.5	23.0	11.55	13.0	11.2	9.1	4.92	6.1	15.6	13.7	8.49	8.3
8.5	34.5	13.78	14.8	16.0	15.6	7.70	7.5	20.5	19.6	8.00	9.0
9.5	46.8	16.82	16.0	22.1	22.1	8.77	8.8	24.9	25.8	9.5	9.4
10.5	63.3	15.72	16.8	30.08	30.0	8.78	9.4	34.0	31.6	9.0	9.7
11.5	73.8	17.43	17.4	36.50	36.4	10.75	9.9	37.42	37.1	8.25	9.9
12.5	82.6	17.89	17.8	40.66	40.9	10.29	10.1	41.83	42.4	9.42	9.9
13.5	89.9	17.94	18.0	43.5	43.5	9.95	10.2	46.86	46.2	10.05	10.0
14.5	93.3	18.67	18.3	45.07	45.0	10.17	10.4	48.35	48.3	9.57	10.0
15.5	95.1	18.00	18.8	45.6	45.5	9.90	11.0	49.55	49.5	10.75	10.1
16.5	95.9	19.14	19.0	46.25	46.25	10.33	11.2	50.7	50.7	10.69	10.4
17.5	96.3	19.88	19.6	45.8	46.8	11.69	11.5	50.95	51.5	10.29	10.5
18.5	97.8	19.00	20.8	48.6	47.0	10.33	11.9	50.88	50.8	10.23	10.9
22.5	97.9	21.35	21.9	48.14	47.0	12.36	12.4	48.1	48.3	11.1	11.2
27.5	95.0	24.00	22.5	44.96	46.5	13.90	12.5	45.45	45.5	12.58	11.6
32.5	88.0	24.00	23.4	45.1	45.5	13.31	13.0	42.91	42.6	12.17	12.0
37.5	86.7	24.00	23.4	45.1	44.5	12.87	13.4	40.1	39.8	12.19	12.5
42.5	84.8	23.90	23.9	45.1	44.5	13.15	13.6	36.6	36.8	12.54	12.8
47.5	81.3	22.20	24.0	43.8	43.5	14.0	14.0				
52.5	77.4	23.73	24.2	41.85	42.2	14.14	14.5				
57.5	74.8	24.77	24.5	40.6	41.0						

* Wechsler, David, *The Measurement of Adult Intelligence*, The Williams and Wilkins Co., Baltimore, 1941, pp. 120-121.

TABLE VI
COMPARISON OF LEWISBURG BETA AND WECHSLER-BELLEVUE
STANDARD SCORES AND SIGMAS *

Age	Wechsler-Bellevue Full Scale			Lewisburg Beta		
	raw mean	smoothed mean	raw sigma	smoothed sigma	raw mean	raw sigma
22.5	98.8	97.9	19.00	20.8	66.9	11.9
27.5	95.9	95.0	21.35	21.9	65.0	12.9
32.5	90.4	91.6	24.00	22.5	62.1	14.1
37.5	86.7	88.0	24.00	23.4	58.7	14.9
42.5	85.1	84.8	23.90	23.9	55.3	15.9
47.5	79.0	81.3	22.20	24.0	52.0	16.8
52.5	77.4	78.0	23.73	24.2	48.7	18.2

* See Table V and Lindner, Robert M., and Gurvitz, Milton S., *A Technique for Test Standardization and Its Application to the Revised Beta Test for Use with Adults*.

II. CRITERIA FOR A STANDARDIZING POPULATION

While most psychologists would agree that a test should be standardized on a representative population, the method of achieving it is another matter. What is sought after is not an absolutely identical population. It would not make any difference, for example, if hair and eye color varied, or the percentage of the left-handed was inaccurate. What then are the factors that merit evaluation in the standardizing population? Briefly they can be subsumed under the headings of: (1) Age; (2) Education; (3) Socio-Economic Status; (4) Sex Differences; (5) Racial and (6) Geographical and Political Distribution.

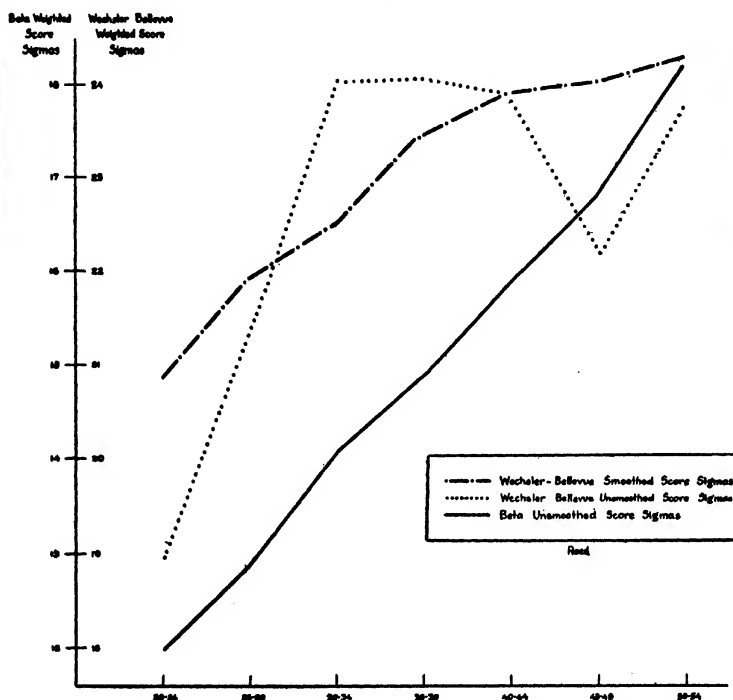
Of these factors age has long been perhaps the most perverse. As obvious as it seems, one of the prime advantages of Binet's pioneering tests was the consideration of the child's age in rating him. While this was patent, it took 20 years of testing before the pattern was modified to include the fact that, beginning with *circa* age 12, the annual increment in intelligence becomes progressively smaller and smaller until maturity is achieved. This type of compensation was first begun by Porteus in 1933 and reached full fruition in the 1937 Stanford Binet. Shortly afterwards, the researches of Wechsler completed the full cycle by pointing out and circumscribing the principle of declining performance with age after maturity; beginning gradually at first, and then in an almost perfect linear relationship, at least to age 65, which is as far as research has penetrated.

Thus our population must have representative samplings of every age group to counterpoise the effect of waxing and waning performance as the individual grows, reaches maturity, and then deteriorates.

Age also becomes a factor when the limits of the group for which an M.A. or an I.Q. is calculated must be considered. This problem of choosing an interval can only be solved by using a general principle which will be applicable to all tests but which may also produce different results with each measuring instrument. The 1937 Stanford Binet, for example, progresses in terms of one month intervals from age 2 to 16. Thus a person's chronological age is rated in years and months. The Wechsler-Bellevue, on the other hand, uses three month intervals from age 10 to 15, one year intervals from 15 to 16, two year intervals from 16 to 20, and five year intervals after 20 years of age. In each case it seems that an interval was chosen that would provide that the I.Q. would advance at the rate of one or two rating points as the mental age increases month by month, or as the chronological age decreases month by month; while in the Wechsler-Bellevue the same occurs with the weighted score and age, although the method of computing an I.Q. differs. This division of the chronological age may very well differ from test to test although the results will in most cases be comparable.

Education should be evaluated in its broadest sense, but unfortunately there seems to be no yardstick for such an intangible, and for group

GRAPH 1
VARIATION in S.D. of WECHSLER and BETA STANDARD DEVIATIONS
 (See Table XX)



measurement school accomplishment in terms of age-grade distribution for all seems to be an accurate delineator. As a yardstick to measure cultural differences between groups it seems to be a sensitive instrument, *i.e.*, the difference between the median achieved grade of a white group and a Negro group is almost exactly proportional to the means of accomplishment of an intelligence test. The chief difficulty in the past has been the paucity of authentic data, but this has disappeared with the publication of Volume IV of the 1940 U. S. Census.

Like education, socio-economic status is a complex factor which, while it may be best

described adjectively, must be expressed as a factor in terms of something that can be evaluated statistically. If a discriminate employment rating is utilized, one that will differentiate horizontally by cutting through artificial barriers to form natural groupings, this ideal can be achieved. While there is still room for improvement, this has been executed by the editors of the 1940 Census who, for the first time, made available groupings, not according to industry, but differentiated according to actual level of the specific job; disregarding in most cases the traditional formalized differences. Thus laborers, whether they work in a ditch, a factory, or

on a ship, are classified together, while the factory manager, the skilled laborer, the semi-skilled employee, the accountant and the filing clerk, although working in the same factory, are placed in their proper category. Again these data appear for the first time in the 1940 Census, Volume III, under the heading of *The Labor Force*.

Sex differences pose many a prolonged enigma to the psycho-metrician. Some sub-tests consistently favor the distaff side, while others give the male an advantage. There has been a current tendency to eliminate these genre of tests in favor of those that show only small differences between the sexes (the 1937 Stanford Binet, the Wechsler-Bellevue, etc.). Two courses seem open: (1) to eliminate discriminating tests; or (2) to construct separate norms for men and women.

If the first course is pursued the differences between the sexes will be so small as to be negligible in most age groups. There seems to be no significant difference between the educational accomplishments of white men and women in the U. S., although there is a marked disparity between Negro men and women in this respect. Whether this is true in the age group from 1 to 5 is as yet not evaluated. The great difference in maturity in favor of females makes it a problem for specific investigation.

It is the considered opinion of the author that the factors embraced under the topic of race are a misnomer. It is an incontrovertible fact that races differ in their performance on intelligence tests, but that does not make the difference due to innate abilities. It has long been known that groups differing in opportunity for cultural advantages are not comparable. There is no reason to suppose that this does not hold true for inter-racial groups. Where this difference is of great magnitude, it is obvious; where it involves the comparison of average white population with a 9th grade education and a Negro group with a 6th grade education (the product of cultural deprivation), it is just as obvious if correctly evaluated. The same facts apply to a French-Canadian, an immigrant from the more backward countries of Europe, or an American Indian.

Distribution as to geographic and political areas is invaluable as a correcting factor for qualitative differentiations in our other factors.

For example, there are many different standards of attainment for the same grade in different areas. A group completing the eighth grade in California or New York has a distinct though imponderable advantage over a similar group completing the eighth grade in Louisiana or South Carolina. Similarly with socio-economic status. An average operator in a southern cotton mill, although plying an identical trade with one in New England, could show enormous differences in education, opportunities for cultural advancement, and even in salary and social position. The same problems exist in comparing a rural with an urban group in debilitating as contrasted with stimulating climates. Therefore, a proper balance as to geographic and political areas will be essential to the exact matching of the population.

III. THE NATURAL DIVISIONS INTO WHICH THE AGES OF INDIVIDUALS FALL FOR TEST STANDARDIZATION PURPOSES

The various ages, for conflicting reasons, cannot be evaluated for standardization purposes in the same manner. Roughly, they would fall into the four classes of: (1) pre-school children; (2) school children; (3) youths; and (4) adults.

Pre-school children must be set apart, but they have in no way tended to classify themselves on a personal basis. They have obviously neither attended school nor have a socio-economic ranking of their own. Therefore, they must be evaluated by a policy of indirection; through their parents. Since data on socio-economic standards are more completely covered for males than females, the use of the male parent alone will not only simplify the standardization but increase its accuracy. The other factors of age, sex difference, race, and geographic and political distribution are just as obviously available directly, and are to be found in the census data, as will be elaborated in its proper place.

School children (5-14), provided that the factors of age, sex, and geographic and political distribution are held constant, will be mainly differentiated by the national standards of age-grade distribution of children in school with socio-economic standards as a correcting factor should the sampling deviate significantly from the national standards for the main parent. Minor deviations will, in all probability, be of

minimal importance, especially if the first named factors are rigidly adhered to.

Youths (15-19), too, must have the standards of age, sex, and geographic and political distribution held constant, but in this age group we must divide the population into two categories which will be standardized separately before they are combined for the ultimate standardization, since the group is sharply divided into those who attend school and those who do not. The individuals who are attending school will be evaluated on the same basis as school children. Those who have left school can now be evaluated by their attainment in school (last school grade completed), and their socio-economic status is evaluated by the positions they hold, although this is less accurate than later in life when more sifting has taken place to assign work of more or less suitable nature in regard to the basic abilities of the individual.

Keeping constant the basic considerations already mentioned, the treatment of adults is based primarily upon the last school grade completed, while this is corrected by further manipulation to assure constancy with the socio-economic status of the nation, and at the same time holding education unvaried. It should be pointed out that the corrector for socio-economic status is much more valid when applied to males than females. This is due to the fact that the percentage of males in the labor force varies from 83 to 95 per cent for adults while in females it varies from 45 to 20 per cent, making discrimination difficult.

IV. THE DATA AVAILABLE TO FULFILL THE CRITERIA FOR EACH AGE GROUP

Since many of the factors are mutual to all age groups they will be discussed separately, while those that are distinctive to their particular age group will be treated under that heading.

Assuming that the test to be standardized consists of sub-tests which do not favor either sex, the standardization population should consist of *circa* 50 per cent males and 50 per cent females, although a slight advantage in favor of the males will bring it into a true relationship, particularly in the pre-school age. As there are but inconsequential differences between age-grade placement for males and females at all ages, the composite of the two is the one pre-

ferred. On the other hand, in such an item as socio-economic status, there are bound to be vast differences, and the sexes must be evaluated separately, then synthesized.

The United States is a nation with a large underprivileged minority, the Negro. This minority, as a whole, has a performance on intelligence inferior to whites. The inferiority seems to be proportional to the amount of cultural deprivation. To make the problem more complicated, the Negro, depending on his amount of cultural deprivation, differs significantly when northern and southern Negroes are compared. This is the problem.

The solution is at present still an uncut Gordian knot. It is true that all good tests today are based on a white standardizing population and therefore are unfair to Negroes as a national group; but northern Negroes, for example, are no more discriminated against than a large majority of southern whites; moreover, southern Negroes occupy a still lower rung on the ladder. Therefore the statistics encountered in this paper will be based on a white standardizing population, the product of which will be unfair to southern Negroes, and which must be compensated for by clinical means. One solution remains, but is still unexplored. In terms of culture the South is a depressed area as a whole. The solution may be found in a regional standardization for which ample materials are available in Volumes III and IV of the 1940 Census.

Proper and due consideration of geographical and political distribution of population fortunately offers a clear cut basis for classification. The data are divided in one section under the headings of urban, rural nonfarm, and rural farm population, and in the other the nation is divided into the broad politico-geographic subdivisions of North Eastern, North Central, Southern and Western areas. The data are presented in Table VII, with absolutes converted into percentages ready for use, and together with the median grade completed for whites.

Since socio-economic status has been discussed at length the table evaluating it is presented without further comment (Table VIII), except to point out the essential separation between males and females in this category.

The factors that will vary individually from the four age categories reduce themselves to two: (1) age and (2) education. Since they

must necessarily vary from category to category they are coupled in the discussion of the data for each group.

Since pre-school children are evaluated in terms of the male parent's education and socio-economic status *q. v.* this will be postponed, but there still remains the pressing question of age in terms of how fine the graduations should be. While it will, of course, vary with the test, it should be desirable (and possible) to discrim-

inate in terms of one or, at most two months.

The education of school children, disregarding sex, is presented in Table IX and it is restricted to whites. In many cases very fine subdivisions have been introduced. While this may be too fine a discrimination for some practical work, it can be modified if necessary. At the same time it provides the necessary data for the most detailed of subjects. It must be expressly noted that it represents the *last* school grade

TABLE VII
POLITICO-GEOGRAPHIC DISTRIBUTION OF THE WHITE POPULATION OF
THE UNITED STATES *
Politico-Geographic Distribution in Percentage

Age	Urban	Rural Nonfarm	Rural Farm	Total %	North Eastern States	North Central States	Southern States	Western States	Total %
Under 5	49.1	24.8	26.1	100.0	24.8	32.2	32.1	10.9	100.0
5 to 9	49.0	23.8	27.2	100.0	26.1	31.5	32.1	10.3	100.0
10 to 14	51.2	22.0	26.8	100.0	27.7	31.6	30.7	10.0	100.0
15 to 19	54.0	20.6	25.4	100.0	28.4	31.9	29.4	10.3	100.0
20 to 24	59.6	20.3	20.1	100.0	29.3	31.9	27.8	11.0	100.0
25 to 29	61.4	21.1	17.5	100.0	29.4	31.7	27.3	11.6	100.0
30 to 34	61.8	21.3	16.9	100.0	29.8	31.9	26.7	11.6	100.0
35 to 39	62.1	20.4	17.5	100.0	30.3	32.3	25.7	11.7	100.0
40 to 44	62.8	19.1	18.1	100.0	31.6	33.0	23.8	11.6	100.0
45 to 49	62.3	18.5	19.2	100.0	31.6	33.9	22.7	11.8	100.0
50 to 54	61.5	18.3	20.2	100.0	31.5	34.2	22.1	12.2	100.0
55 to 59	59.9	18.7	21.4	100.0	30.9	34.4	22.3	12.5	100.0

* Sixteenth Census of the United States, 1940, Vol. V, pt. 1, Table 3, pp. 13-14 and Table 27, pp. 98-99.

completed, and that modification, such as has been done in the earlier tables of this paper, is necessary for comparative purposes. The census itself makes the assumption that an extremely large majority are in the grade directly above the one designated as completed. The age categories will most probably be separated by an interval of two or three months and should by now discriminate to at least one I.Q. point or its equivalent.

Youth statistics (white) regarding education are presented, as stated in two tables. Table X represents those who are still attending school while Table XI represents those who have left school for any reason whatsoever. As in the previous educational tables, they are expressed in terms of last school grade completed and should be treated accordingly. As we approach

maturity, processes of growth and maturation become more complete and are greatly but gradually decelerated. Therefore our discrimination in age will jump abruptly from three or four months to one or two year intervals to maintain the same standards of the equivalent of one I.Q. point gradation.

To complete our pyramid we provide the educational accomplishments of the adults of the nation (Table XII). All the cautions and provisos previously made also apply to these tables which are likewise restricted to whites. The sudden spurt in education in the last 12 years represents an unequalled increase and is a factor by no means to be disregarded in terms of education, sociology, and testing. Age groups, due to the at first almost minute "deterioration" in intelligence, are comparatively long (five

TABLE VIII
SOCIO-ECONOMIC STATUS OF WHITE ADULTS IN PERCENTAGE *

Classification	Male						Female					
	16-17	18-19	20-24	25-34	35-44	45-54	55-64	16-17	18-19	20-24	25-34	35-44
Not in Labor Force	71.0	35.0	12.0	4.8	5.3	8.0	18.3	87.1	60.0	54.9	67.1	73.1
Public Emergency Work	2.1	6.5	5.2	4.3	4.5	5.0	4.7	1.0	2.4	1.4	.6	.9
Unemployed, Experienced	3.1	8.5	10.2	7.2	6.2	6.9	6.9	1.6	4.8	4.0	2.1	1.6
New Workers	4.4	7.0	2.5	.2	.0	.0	.0	2.6	4.8	1.4	.2	.1
Employed												
Professional Workers .....	.2	.5	2.6	6.1	5.5	4.4	3.8	.1	2.0	4.8	5.0	3.7
Farm Owners and Operators ..	.4	1.6	4.8	8.4	11.6	13.7	16.2	.0	.0	.0	.1	.2
Proprietors, Managers, etc. ....	.2	.4	2.2	6.8	10.7	11.8	10.2	.0	.1	.3	.8	1.5
Clerical, Sales, etc.	2.5	7.2	12.4	13.0	11.5	9.4	7.3	1.1	9.9	15.4	10.9	7.4
Craftsman, Foreman, etc. ....	.4	2.4	7.0	12.0	15.2	15.6	12.5	.0	.1	.3	.3	.3
Operatives, etc.	2.5	9.6	18.2	20.2	15.9	12.4	8.3	1.2	5.8	8.4	6.4	4.7
Domestic Service .....	.2	.1	.1	.1	.1	.1	.1	2.8	4.8	3.6	2.7	3.0
Protective Service .....	.1	1.8	1.9	1.4	1.7	1.6	1.6	.0	.0	.0	.0	.0
Service Workers .....	.9	2.0	2.7	2.8	2.9	3.0	2.8	.7	2.9	4.0	2.9	2.6
Farm Laborers and Foremen...	9.8	12.3	10.0	5.0	2.8	2.3	2.4	1.4	1.5	.6	.4	.5
Laborers, except Farm and Mine	1.5	4.4	7.4	6.9	5.6	5.3	4.5	.1	.3	.4	.3	.2
Occupation Not Reported .....	.4	.7	.8	.6	.5	.5	.4	.2	.5	.4	.3	.3

* U. S. Census for 1940, Volume 3, part 1, Table 65. These values are approximate due to lack of specific data but will not vary from the true data .2%.

TABLE IX
EDUCATION OF WHITE CHILDREN 5 TO 14 YEARS OF AGE •
Last Grade Completed in Percentage

Age	0	1	2	3	4	5	6	7	8	9	10	11	12	Total %
5	95.4	4.5	.1											100.0
6	64.6	33.6	1.7	.1										100.0
7	19.3	57.8	20.6	1.9	.2	.1	.1							100.0
8	3.8	26.4	48.4	18.9	2.0	.2	.1	.1						99.9
9	1.4	6.8	26.8	44.8	17.8	2.1	.3	.1	.1					100.2
10		2.4	8.9	26.7	41.6	16.7	2.3	.3	.1	.1				99.9
11		1.0	3.4	9.0	26.2	39.8	16.4	.1	.4	.1				99.9
12		.6	1.7	4.5	10.8	25.2	37.6	15.6	2.6	.6	.1			99.9
13		.5	.4	.9	2.2	5.1	24.6	36.2	15.4	3.4	.4	.1		100.1
14		.5	.3	1.3	2.7	5.3	11.4	23.7	33.8	17.0	2.9	.4	.2	100.1

• Sixteenth Census of the United States, 1940, Vol. IV, pt. 1, Table 15, p. 43.

TABLE X
EDUCATION OF WHITE YOUTHS 15 TO 19 YEARS OF AGE WHO ARE ATTENDING SCHOOL •
Last School Grade Completed in Percentage

Age	% of Total Population	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 and over	Total %
15	88.8	.1	.2	.2	.4	1.0	2.3	5.4	11.4	22.9	36.9	15.6	2.9	.4	.1					99.8
16	77.9	.1	.2	.3	.3	.5	1.0	2.2	4.9	10.3	25.9	35.9	16.1	2.2						99.9
17	63.0		.1	.2	.3	.3	.4	.8	1.8	4.0	10.9	25.6	42.3	10.3	2.4	.6	.2			100.1
18	37.7		.1	.1	.3	.1	.3	.2	.5	.2	2.0	4.9	12.4	39.9	8.9	1.9	.1			99.6
19	21.6		.1	.1	.2	.2	.2	.3	.5	1.4	2.8	6.3	21.9	29.4	23.2	10.3	2.5	.5	.1	100.1

• Sixteenth Census of the United States, 1940, Vol. IV, pt. 1, Table 16, p. 55

TABLE XI
EDUCATION OF WHITE YOUTHS 15 TO 19 YEARS OF AGE WHO ARE OUT OF SCHOOL •
Last School Grade Completed in Percentage

Age	% of Total Population	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total %
15	11.2	3.8	1.1	2.4	4.1	6.4	7.8	10.4	13.3	30.1	13.4	5.5	1.0	.5					99.8
16	32.1	2.1	.7	1.4	2.5	4.3	5.8	9.1	13.0	29.3	14.9	11.3	3.8	1.8	.1				100.1
17	37.0	1.3	.4	.8	1.6	2.8	3.9	6.6	10.3	25.2	14.0	13.6	8.0	11.0	.2	.1			99.8
18	62.3	.8	.3	.6	1.1	1.9	2.5	4.4	7.0	18.7	10.5	11.4	7.8	31.7	1.0	.2		.1	100.0
19	78.4	.7	.2	.4	.8	1.4	1.9	3.5	5.7	16.4	9.0	10.5	7.2	38.9	2.3	.8	.1	.1	99.9

• Sixteenth Census of the United States, 1940, Vol. IV, pt. 1, Table 17, p. 67.

TABLE XII
EDUCATION OF WHITE ADULTS •
Last School Grade Completed in Percentage

Age	Mean Grade Completed	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total %
20-24	10.4	.6	.2	.3	.7	1.2	1.6	2.9	4.9	15.9	7.5	9.3	7.0	34.4	3.7	3.9	2.3	3.0	.6	100.0
25-29	10.1	.7	.2	.4	.7	1.4	1.9	3.6	6.0	20.7	7.7	9.5	6.0	27.0	2.8	3.4	1.6	4.8	1.6	100.0
30-34	9.8	.9	.2	.5	1.0	1.9	2.4	4.5	6.8	24.4	7.3	9.2	5.3	20.8	2.7	3.6	1.6	5.0	1.8	99.9
35-39	9.3	1.4	.3	.7	1.5	2.7	3.2	5.5	7.6	28.9	6.8	8.1	4.0	16.2	2.3	3.3	1.3	4.4	1.6	99.6
40-44	8.9	2.3	.4	1.0	2.0	3.5	3.8	6.3	7.4	31.3	6.2	7.0	3.3	14.3	2.2	2.9	1.1	3.7	1.4	100.1
45-49	8.3	3.8	.6	1.4	2.6	4.5	4.6	7.1	7.2	32.1	5.6	5.9	2.7	12.1	1.8	2.6	1.0	3.2	1.2	100.0
50-54	8.1	4.9	.7	1.6	2.9	5.3	5.1	7.7	6.9	33.0	4.9	5.1	2.2	10.9	1.6	2.3	.8	3.0	1.1	100.0
55-59	7.8	5.3	.7	1.7	3.1	5.9	5.6	8.0	6.8	33.9	4.5	4.5	2.0	10.2	1.5	2.0	.7	2.6	1.0	100.0

• Sixteenth Census of the United States, 1940, Vol. IV, pt. 1, Table 18, p. 70.

years) and fall in well with the divisions of the census.

V. STATISTICAL AND MATCHING PROCEDURES

Now that psychologists are able to avail themselves of the accurate information regarding the phases of test standardization, it would seem that the reliance on chance in which so many tests have placed their faith in whole or in part should be eliminated as much as possible. To do this it is necessary to test a much larger number of persons than will ultimately be used. From this much larger population, which can be termed the initial population, a selected population can be calculated which will fulfill, in the ways outlined, the requisite of representing faithfully the white population of the U. S.

The method itself is simply to equate the initial population for that category against the standards outlined. The item that least meets the criterion then becomes the central figure, and the others are cut to reduce them to a comparative percentage to the control figure. Then the initial population in that category is thrown into a distribution, and the tests to be subtracted are done so in the proportion of the initial population. Since education seems to be our most reliable single criterion, this will be our prototype, with the others used as secondary correcting paradigms. In many cases it will be found that the sampling itself will be so slight that correction will be unnecessary, but this can never be relied upon. The final norms will be a reflection of the meticulousness with which this procedure has been adhered to.

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INTELLIGENCE TESTS AND TESTING.

—The history of the testing of mental functions during the past one hundred years epitomizes the change in psychology from a structural to a functional emphasis. When Fechner stated his logarithmic law he believed that he had established a mathematical relationship between the physical and the psychical world, between body and mind. For forty years after the enunciation of his law experimental psychology remained an unapplied science, and psychologists continued their interest in the fundamental issues as to the nature and structure of mind. Not until the turn of the century was there any considerable emphasis by psychologists upon the discrimination of differences between minds and the nature of the differentiae, in and for themselves. By this time Galton, in England, had shown the possibility of many types of physical and mental measurements; Cattell had laid the foundations of mental testing in the United States; and Binet, in France, was on the threshold of publishing his first scale for the measurement of mental ability.

The development of mental testing might have gone along the psychophysical lines laid down by Weber and Fechner and continued by Wundt; or it could have developed by way of Ebbinghaus, Oehrn and Binet towards the examination of more complex intellectual functions. That the development was mainly in the latter direction may have been due to the increasing need for discriminating devices in the

rapidly developing systems of mass education; it may have been aided by the sometimes close conjunction of physical anthropology and psychology; and it was doubtless stimulated by the work of Galton and Cattell, both of whom held the view that the measurement of individual differences was likely to be one of the most fertile fields in the new science of psychology.

Justification for the use of tests for the measurement of intelligence would be more convincing to some if a universally accepted definition of intelligence were available. There are those whose writings suggest postponement of intelligence testing until the nature of intelligence is known. Such a position is untenable. The psychologist is, in some respects, not much worse off in the field of measurement than the physicist. The latter would be hard put to give a complete description of the nature of electricity, yet can make measurements of its functions which are adequate in terms of the assumptions upon which they are based. Moreover, through his attempts to measure electricity, inadequate though they be in some respects, the physicist is probably closer to a statement about the nature of electricity than he would be had he refused to use the limited possibilities of measurement available to him.

Successful measurement in any field would depend upon happy accident unless some assumptive bases were used. Eight decades of scientific research have seen proposed a number of assumptions with respect to intelligence. Ebbinghaus suggested that "intellectual ability consists in the elaboration of a whole into its worth and meaning by means of combination, correction and completion of numerous kindred relationships." Meumann stated that intelligence is the "power of independent and creative elaboration of new products from the psychical material provided by the senses." Binet believed that intelligence was characterized by "the ability to select and maintain a definite psychic direction, by the ability to make adaptations leading to a desired end, and by the ability to criticize one's own behavior." Spearman regarded intelligence as the ability to deduce relationships and correlations. In a symposium on intelligence in 1921 (31) a number of psychologists contributed their views on the nature of intelligence. Thorndike defined it as the power of making good responses; Terman considered an individual intelligent in proportion

as he is able to carry on abstract thinking; Colvin regarded intelligence as the ability to adjust to the environment; Pintner as the ability to adapt to relatively new situations; Woodrow as an acquiring capacity.

Some degree of confusion in the measurement of mental functions can be ascribed to the nominative use of the term "intelligence." Such usage is probably a legacy of "faculty" psychology; "intelligence" and "intellect" with "emotions," "perceptions," "ideas," "thoughts," etc., used in the nominative sense, are often regarded as entities rather than as functions. The quest after the ultimate nature of intelligence is a worthy scientific occupation; however, until success in this direction is achieved, it is pertinent to keep in mind the assumption that intelligence tests are measuring a functioning complex rather than a defined entity whose nature and structure are known. Such an assumption implies that some degree of intelligence is inferred by behavior under test conditions and not that intelligence is directly measured. For an assumption of this kind there is ample justification; in all metricized sciences use is made of inference in measurement. Temperature is inferred from the length of a column of mercury; air pressure from the height of a mercury column; electric current from the rotation of an armature; sugar in solution from the rotation of a beam of polarized light.

There is a common thread of meaning running through most of the definitions of intelligence. The power of independent and creative elaboration; the ability to make adaptations; the ability to handle abstractions; the capacity to adjust to the environment; these and similar abilities are a function of the individual's apprehension of relationships. The degree of success or failure, in every behavior response, will vary with the individual's ability to deduce relationships, whether the latter be concrete or abstract. The measurement of intelligent behavior, then, will be dependent upon the individual's successes or failures in the deduction, the apprehension and the reconstruction of relationships. It should be clear that this is no definition of the nature of intelligence, but a description of its manifestations. In view of our present knowledge of intelligence such a description is justified; it is the outcome of a plausible inference that there is a relationship between intelligence—whatever that may eventually prove to be—

and behavior, and that what is regarded as intelligent behavior is the result of functioning intelligence.

Differences among individuals in their manipulation of environmental processes make comparisons possible. There could be developed, as the result of such comparisons a relative scale of mental ability. Units of measurement on such a scale would be relative, and not absolute. Since it is impossible to use all elements of behavior in a single test, or to measure all individuals in a defined population, the test constructor is faced with two problems: the selection of appropriate behavior items, and the sampling of a defined universe.

As early as 1890, Alfred Binet expressed the view that tests of intelligence should measure the more complex mental functions. In his first scale (1905) the items selected indicated his attempt to sample the behavior universe of children of his culture, and thus measure intelligence in whatever ways it was manifested. The items selected for this scale were simple, varied, and of such a nature that the answers depended upon general learning to be expected of all in the culture, and not upon any special training. Probably the most careful selection of items was that made for the New Revision of the Stanford-Binet Scale. Several thousands of items were considered, and selection was made eventually upon the bases of "(1) validity (2) ease and objectivity of scoring, and (3) various practical considerations such as time economy, interest to the subject, need for variety, etc." (23). It will be apparent from a study of the technique used by the authors of this test that the final selection of items in an intelligence test is dependent upon an analysis of the responses of the individuals in the standardizing group, and not upon the arbitrary judgment of the constructor.

If the intelligence test is to be used beyond the standardizing group the latter must be a sample typical of some defined population. "The fundamental requisite for adequate sampling is that each individual of the defined universe must have an equal chance of being drawn, and that once drawn no unit may be discarded without risk of bias" (17). Sampling for the purpose of test standardization will involve the selection of individuals by stratified sampling using bases known to be relevant to variations in intelligence. This would include age and sex

groups, urban and rural populations, geographical groups, socio-economic strata, nationality of descent, etc. It is important to remember that a sample typical of one defined universe may not be typical of any other; therefore a test standardized on a sample typical of one universe may not be used on an individual or sample from another universe unless it can be shown that the latter universe is in essential respects comparable to the former.

It has been argued that since intelligence has a biological basis, the distribution of intelligence should conform to a normal curve. There are, however, some biological characters which do not conform to a normal curve, and intelligence may be one of these. It should be remembered that the shape of any distribution is determined partly by units of measurement. Few test authors assume equality of units of measurements for their tests. In the Stanford-Binet Scale items were selected so as to ensure that the mental age of an age group equalled its chronological age. This scale does not pretend to measure in equal units; it is a scale showing the ability of the tested individual in comparison with other individuals in various age groups. The distribution of the intelligence quotients of the children of the standardizing group ($N = 2,970$) is very close to a normal curve (16); however, in view of the lack of equality of units, it would be unwise to infer that the underlying trait intelligence is normally distributed. Thorndike's distribution on the basis of equal units seems to dispose of this problem in favor of normalcy; but since his equal units were established by the use of normal curve functions he has merely demonstrated normalcy by assuming it in advance.

Age scales of the Binet type are individual tests; only one subject can be tested at one time; the process requires the services of a well-trained examiner; large scale testing is difficult; psychological factors, such as rapport and incentive, need careful control. On the other hand, by means of group tests, most of which are point scales, many subjects may be tested at one time; such tests require a minimum training on the part of the examiner; scoring is easy and objective. While the individual test has some disadvantages, it gives more accurate results than the group test when administered under standardized conditions by a competent person. Both types of test have their place in a testing pro-

gram. There are occasions, in educational, military and industrial classification, when to give individual tests would be a waste of time; while in most clinical examinations, for diagnostic purposes, measurement by individual tests is essential.

According to the type of material and the nature of the instructions, tests may be classified as verbal or non-verbal. Most of the Binet type tests, while predominately verbal, use non-verbal material, particularly for the lower age levels. The development of non-verbal tests has been of importance during the past twenty-five years. Non-verbal material includes geometrical designs, pictures, maze diagrams, blocks, models, beads, form boards, etc. Non-verbal tests are used in testing programs involving young children, the mentally immature, the deaf, persons of limited verbal ability or expression, and the language handicapped.

Since the publication of Binet's first scale in 1905 there have been developed intelligence scales, individual and group, which, in the light of the accumulated evidence, do measure intelligence in terms of a relative scale. Since all measuring devices, for the measurement of physical as well as mental functions, are subject to their errors of measurement, the values obtained by the use of intelligence tests are observed values, not true values. This does not constitute any serious drawback to the use of intelligence tests, since it is possible, by the use of statistical methods, to make a statement relative to the true value in terms of the observed value.

One of the reasons for the development of the early mental scales was the need for selecting from the school population those children who, because of low mental levels, could not be expected to profit educationally in the regular school situation. With the rapid growth of mass education during the past five decades it might have been expected that testing programs would have increased in importance in educational systems. Such an expectation has hardly been realized. True it is that there are many school systems, and many individuals occupied in educative processes, that have made use of the results of intelligence tests, both as selective and as diagnostic instruments. There are, however, many systems that have remained oblivious to the possibilities of mental testing; there are relatively large educational areas in which no psychological services are available either for

teachers or pupils. An analysis of the mental ages of 2,106 of the children who comprised the standardizing group of the New Revision of the Stanford-Binet Scale indicates the wide range of mental age in the elementary school grades (16). Whatever may be the solution to the problem of heterogeneity of class groups, and there has been rather more opinion than fact surrounding this problem, it cannot be denied that "a teacher confronted with the necessity of teaching *en masse* third-grade children ranging in mental age from six to twelve years, or sixth-grade children of mental ages from eight to sixteen years, must indeed be versatile if she is to provide learning situations appropriate for all" (16). In view of the representative nature of this relatively large sample there is reason to believe that the analysis draws a fairly true picture of school grading practice. Moreover, since it is known that intelligence testing is common practice in some of the areas from which the sample was drawn it seems likely that even where results are obtained they are, by some educational authorities, viewed with suspicion or ignored.

The success of the Army testing program in 1917, when tests were administered to more than 1,750,000 army recruits, was sufficient justification for the reestablishment of a testing program on a greatly enlarged scale at the outbreak of World War II. Although much of the test material is restricted, particularly in the areas of technical aptitude, reviews of the aspects of the program which have appeared in current journals have indicated some of the scope and success of the program. In industry, too, during the past few years, there has been increased interest in the predictive possibilities of test results in industry; it is not unlikely that the field of industrial personnel relations will, after the war, increase greatly the scope and usefulness of the psychometrician.

CHRONOLOGICAL OUTLINE OF MENTAL TESTING

- 1879 W. Wundt. Establishment of psychological laboratory at Leipzig.
- 1882 F. Galton. Establishment of Anthropometric Institute, London.
- 1890 J. McK. Cattell. Use of "mental tests" at Columbia University.
- 1895 A. Binet and Th. Simon. Early work in complex mental processes.
- 1897 H. Ebbinghaus. Development of completion tests, Breslau.

- 1900 W. Stern. "Psychology of Individual Differences."
- 1901 C. Wissler. Correlation of mental and physical traits.
- 1904 C. Spearman. Enunciation of two-factor theory of intelligence.
- 1905 Binet-Simon first published scale.
- 1906 R. De Sanctis (Rome). Development of scale.
- 1908 Binet-Simon. Revision of scale on age-level basis.
- 1911 Binet-Simon. Final revision of scale.
K. L. Johnson. English translation of Binet's 1908 scale.
H. H. Goddard. America's revision of Binet's Scale.
- 1912 Z. Treves and U. Saffiotti (Italy). Development of scale for testing.
- 1915 R. M. Yerkes. Development of point scale.
- 1916 L. M. Terman. Stanford Revision of the Binet Scale.
S. D. Porteous. Development of maze tests.
Development of Army Alpha for selection of recruits.
- 1917 R. Pintner. D. G. Paterson. Performance Tests.
- 1918 S. A. Otis. Group intelligence tests.
- 1921 C. Burt. London Revision of Binet Scale.
- 1922 F. Kuhlmann. Revision of Binet Scale.
Otis Self-Administering Test of Mental Ability.
S. C. Koh's Block Test (Performance).
J. P. Herring. Revision of Binet Scale.
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G. E. Phillips. Australian Revision of the Binet Scale.
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INTERESTS.—The term is used to designate a concept pertaining to factors within an individual which attract him to or repel him from various objects, persons and activities within his environment. The concept is primarily an affective one. Its subjective expression, with emphasis upon the feeling component, is inferred through observations or behavior which can be interpreted as indicating liking or disliking, such as oral or written statements. Its objective expression, with emphasis upon the gross motor components, is inferred through observations of behavior which involve an approach to and a choice of alternatives which are equally available to the individual insofar as environmental barriers do not influence this choice. When a man says he likes the work of a journalist, his subjective interest in this vocation can be inferred. When he is presented with the choice of playing one of two equally demanding games, his choice of one of these games can be interpreted as objectively showing he has a greater immediate interest in that game. Therefore, an individual is said to be interested in an activity, person or object if he either expresses a liking for or makes a choice of that activity, person or object. These activities, persons and objects may be called "interest objects" insofar as the interest of the individual is directed toward them. The relativity of interests is demonstrated by the preferential hierarchy formed for each individual by these interest objects.

In defining interests, several criteria have been employed. The presence or absence of interests has been inferred when these criteria have been applied to the observed behavior. Attention and interest were regarded as synonymous by James Mill, and Henry James called attention the main criterion of interest. An individual was interested in the object or activity which held his attention. Attention wandered from that which did not interest the individual. If a child was to learn, he must pay attention in the classroom, and if he was to pay attention, his interest must be sustained. Herbart was the first to emphasize this interest factor in educational theory. If attention was shown, interest was present. Interest, however, is not the only factor determining attention.

Another criterion of interest, in more general use today, particularly in vocational guidance, and already mentioned, is a criterion based

upon the process of choice. In the presence of several alternatives, all equally available, the person will choose that alternative which most interests him. A person more interested in golf than in tennis will spend more time on the golf course than on the tennis court. Presented with a choice of two or more alternatives, an individual demonstrates an interest by making a choice of one of these. Again, interest is not the only factor influencing choice.

Another criterion of interest is persistence. A person will persist in an activity which interests him and will forsake an activity in which he has no interest. A boy who builds model planes for a few days and then puts away his kit and forgets about it is said no longer to be interested in model building. Very few people will voluntarily stay at a task which does not interest them, but as interests are not the sole influences acting upon persistence, some people spend a lifetime on a job which does not interest them. Here again the matter of choice enters in, for given a satisfactory alternative, the uninteresting behavior should not persist and the choice would be made in favor of the alternative.

Success has been employed as another criterion of interest. A child has been described as interested in the class in which he does successful work and that subject in which he receives his best grades has been called his most interesting subject. Interest in an occupation has been considered essential if a man is to be successful in that occupation and such success is said to be indicative of interest. Because success is so dependent upon factors of ability and opportunity, its presence or absence is considered a precarious criterion of interest.

Other criteria of interests have been used by various workers. Differential remembering has been used as indicative of relative interests. Presented with a variety of situations, the individual will tend to remember most about those situations in which he is interested. Learning has also served as a criterion of interest. The facts and behavior which are most easily learned are the most interesting. Positive relationships have been reported between vocational interest tests and information tests. Students with high scores on the physician's scale of the Strong Vocational Interest Blank, for instance, tend to have relatively high scores on the science and medicine sections of the Cooperative Content-

porary Affairs Test, while those students with high interest scores on the lawyer's scale tend to have high scores on the other sections of the information test. The criteria involving learning and remembering are closely related to the criteria involving success and questions of ability and opportunity again complicate the direct application of these criteria.

Set, or predisposition, also serves as a criterion of interest. The individual will most probably respond to that situation which interests him most. The tendency to initiate a response toward a given interest object is similar to the tendency to direct attention toward that object.

Emotions, or feelings, as inferred from the individual's verbal or motor behavior, offer the most convenient criterion of interest. Asking a man in an interview or on a questionnaire blank is an economical and easy way of determining what he likes and what interests him. As the feeling component is essential in every definition of interest, the most generally accepted and widely employed criterion of interest is the feeling. The emphasis upon the feeling component is what demarcates the concept of interests from other concepts in the general field of motivation. When a feeling aroused by a stimulus is pleasant, an interest is said to be present. When the feeling is unpleasant, an aversion is present.

Interests have been classified in various ways upon the basis of the interest objects associated with the interests. A person responding to a vocation or occupation is showing a vocational or occupational interest. A person responding to a school subject is showing an educational interest, and a person responding to a recreational activity is showing a recreational interest. More specific classifications are often convenient. When a person's response is directed toward a machine, he is showing a mechanical interest. Depending upon the situation, this mechanical interest may be either a vocational interest, in relation to a job, an educational interest, in relation to a school shop course, or a recreational interest, in relation to a hobby involving machine work. The possible classifications of interest objects are numberless. Some of the classifications used include social interests, mechanical interests, intellectual interests, scientific interests, verbal or linguistic interests, literary interests, musical and artistic interests, clerical

and business interests, sales and persuasive interests, and mathematical interests.

The dimensions of interests considered in current research and theory include their duration, their extensity and their intensity. Interests may be described in terms of how long they persist. Some interests are shown by almost everybody from a very early age to death. Some interests, equally persistent, appear in but a few individuals. Other interests, both those shown by many people and those shown by but a few, may endure for but a few hours. The permanence of interests is more striking than their transiency but many interests do endure for relatively brief periods of time.

The extensity of interests may be described in terms of the number of specific interest objects toward which the interest is directed. One man with predominantly mechanical interests may actually only show interest in typewriters but another man with mechanical interests may be interested in typewriters, automobiles, lathes and washing machines. Although both men possess mechanical interests, the latter can be described as showing the more extensive mechanical interest. In general, the more extensive is a man's total range of interests, the greater is the probability that he will make a healthy psychological adjustment to his environment, as psychoneurotic and inadequate individuals are characterized by their restricted ranges of interest.

The third dimension of interests is intensity. According to the criterion of interest employed, interests can be quantitatively ranked according to their intensity, or strength. When one alternative is chosen in preference to another, interest in the first is greater than in the second. When persistence is greater in one activity than in another, more interest is being shown in the first activity. Interests can be rated by individuals according to intensity. The intensity of an individual's interests can also be estimated by comparing his interests to those of other people whose interests are of a known intensity. This is most feasible with interest inventories, where the external referent has been most used in measuring the relative strength of interests.

FACTORS ASSOCIATED WITH INTERESTS

The interests of an individual are determined by a multitude of conditions, many of them

existing in early childhood or infancy. Some conditions, such as age, bear a direct influence upon interests. Other conditions, such as ability and educational factors, vary concomitantly with interests but the exact relationships between these conditions have not been ascertained. Genetic limitations determine what interests will develop but the variety of developments possible within these limitations is so wide that the early social conditions, familial, educational and recreational, are to be considered as the primary factors determining interests.

Insofar as an infant's attention is centered upon himself, he possesses no extrinsic interests and the existence of these interests cannot be inferred until the child is seen to respond to the objects and activities of his environment. The first few months of the infant's life show an increasing tendency to respond to the external world and by the third month the child is showing interest in certain restricted aspects of his environment. A little later, the child shows preferences for certain toys and persons and expresses aversions for those things which have obtained negative interest value for him. By the end of the first year the normal infant is quick to express interest both by his motor and verbal behavior.

The range of interests of the child changes as he becomes older, the greatest increase in this range occurring during the first few years. As the perceptual, cognitive and learning abilities of the child develop and as the variety of experiences to which he is exposed increases, his interests develop correspondingly. By the age of three years he is showing unmistakable interest in other children, in the adults around him and in the mechanical and biological events that surround him. The next years show an increasing interest in recreational and play activities and in vocational pursuits of the adult world.

Within given age groups, a community of interests is easily detected and the influence of tradition and custom upon these interests is obvious. Boys of a certain age and from a given economic and cultural background will tend to have interests in hobbies such as stamp collecting and model plane building. Other children of the same age but from a rural background will tend to show a greater interest in pets or hunting. Age norms for play inter-

ests of children have been developed by Terman, and Lehman and Witty.

Children in the early grades are most interested in subjects which permit bodily activity. At about the age of eleven, interest is to some extent transferred to subjects where perceptible results are obtained and where achievement is easily observed by the child. Later interests are centered upon the more utilitarian subjects, and school activities which appear most relevant to the future of the child become more interesting. Educators have discovered the futility of introducing subject matter to a child before his interest development has reached an appropriate stage. Under guidance, this interest development can be stimulated and directed, within limitations, as elementary teachers do when they attempt to bring the child to an adequate stage of reading readiness. The limitations mentioned are determined by the physiological, psychological and social maturation of the child.

The vocational interests of small children, as shown by their preferences, are characterized by their lack of realism. The child is attracted either to the occupation of the father or a favorite relative, or, in case that occupation is deficient in the excitement and variety demanded by the child, to colorful occupations such as fireman, railroad engineer, and more recently, aviator. The limited range of occupations preferred is demonstrated by comparing the 17,000 different titles included in the Dictionary of Occupational Titles to the one hundred or less preferred occupations that will be named by almost any group of children.

The vocational choices of individuals tend to become more realistic from junior high school through college, as the age of actual occupational embarkation approaches. When students seriously start to consider training requirements as compared to limitations of ability, their vocational choices tend to shift from the glamorous to the practical. That this shift is not characteristic of all individuals is evidenced by the discrepancy found between job opportunities available and the number of children and students planning to enter different occupations. For instance, although only seven per cent of all workers are in the professions, 18 per cent of one group of students choose these professions, and while 35 per cent of all workers are in unskilled jobs, only seven per cent of this group of students choose these jobs.

Vocational interests, as measured by interest inventories, show consistent and systematic changes with age. These changes can be described in terms of their masculinity-femininity, as measured by the Strong Vocational Interest Blank. Masculine interests, possessed by engineers, chemists, farmers, and physicists are directed toward mechanical occupations and activities and athletic and active recreations such as camping and hunting, while feminine interests, possessed by artists, lawyers and journalists, are directed to music, cultural activities and social welfare and linguistic occupations. The interests of boys tend to become more masculine during early adolescence and then gradually become more feminine. The interests of women become more feminine with increasing age.

Measured vocational interests reach a point of relative stability approximately at the time of physical and intellectual maturity and the general trend of interests can usually be clearly perceived as early as 14 years of age. Thus, if proper precautions are observed, the vocational interests of high school boys and girls are sufficiently stable to allow them to be used for guidance purposes. The stability of interests is shown by the correlations ranging from .74 to .90 between tests and retests given to a group of adults by Strong after an interval of one and one-half years. Follow-up studies after periods of five and ten years show the stability of vocational interests approaches that for measured abilities and intelligence. The more generalized the interest, the greater is the stability; the more specific the interest, the greater the probability of change.

As successively older groups of men at a relatively high economic level are studied, their interests tend to become more aesthetic, more cultural, less athletic and more feminine. However, interests, like many other attitudes, are well formed before the end of the second decade of life and after that time, in the typical adult, show little change.

The influence of sex upon interests has received as much attention as any other of the factors determining interests. During the first few years of life, the interests of boys and girls begin to be differentiated. Until early adolescence this differentiation is relatively slow and many children of one sex tend to show the interests that are commonly assumed characteristic of the other sex. During puberty and early

adolescence, endocrinological changes and emphasis upon social sexual patterns of behavior are accompanied by changes in interest, and as boys mature physiologically, they become more interested in girls, heterosexual recreations and clothes. These changes in interest appear more dependent upon physiological age than chronological age. Children failing to show these changes are considered personality deviates and the adult male whose interests are similar to those of the average woman is definitely a deviate.

The interests of many diagnosed male homosexuals have been shown by Terman and Miles to be more feminine than the interests of the average woman but many homosexuals do not have feminine interests and only a small proportion of men who have feminine interests are known to be homosexual.

The vocational interests of boys and girls differ widely, as shown by their occupational preferences. For example, in one study, 17 per cent of the boys graduating from high school wished to become engineers while only .1 per cent of the girls preferred this occupation. On the other hand, 19 per cent of the girls preferred teaching while only four per cent of the boys preferred this occupation. The differences in training and job opportunities for the sexes influence this difference in occupational preference, and evidence from Russia suggests that when these opportunities are equated, the occupational choices of boys and girls may become more similar.

The sex differences in measured vocational interests have already been mentioned. The vocational interests of junior and senior high school boys, as measured by the Strong Interest Blank, are similar to the interests of engineers, chemists, farmers, physicists, personnel managers and purchasing agents while the vocational interests of girls are more similar to the interests of architects, artists, lawyers, journalists, ministers and advertising men. Using the Kuder Preference Record, high school and college boys tend to obtain higher scores on the science, computational and persuasive scales and girls higher scores on the music, artistic, literary and social service scales.

To what extent these sex differences in interest can be attributed to biological and physiological factors and to what extent they result from social conditions is today unknown.

The ability of the individual is another factor bearing a possible influence upon his interests. One hypothesis, as yet unproven, is that a person's ability determines his successes and failures, and that success experiences foster the development of interests. Therefore a person's interests are indirectly a function of his ability. This hypothesis gained support from the results published in the 1920's which showed a correlation of about .80 between the interests a person judged himself to possess and the abilities he possessed, as determined by his own judgments. These results were not substantiated, however, when more objective estimates of interests and abilities were obtained.

These later results lead to the conclusion that interests and abilities appear to be independent variables; each one contributing its own quota to ultimate success. At best, interests are only slightly suggestive of ability. Between mechanical interests and mechanical abilities the correlations range from .15 to .35. The correlations between scores on 35 of the occupational scales of the Strong Vocational Interest Blank and the Thorndike Intelligence Examination for High School Graduates range from + .38 to - .33. Correlation ratios between six representative scales of the Interest Test and the factor scores of the Tests of Seven Primary Mental Abilities range from .04 to .31 with a median correlation ratio .09. Other studies involving the comparisons of groups with and without measured vocational interests reveal but few differences in abilities; and these differences rarely reach statistical significance. Interests as measured by other interest tests show a similarly small association with ability and intelligence.

The relationship between ability and vocational interests, as indicated by occupational choice, is perhaps greater than that between ability and measured interests but this relationship is still surprisingly small. In a study of 1500 junior and senior high school students, the median I.Q. of those students choosing a profession was 108; the median I.Q. of those choosing business or clerical work was 105; the median I.Q. of those choosing a skilled trade was 103; the median I.Q. of those choosing a semi-skilled trade was 102; and the median I.Q. of those choosing an unskilled trade was 100. No pupil with an I.Q. of between 120 and 150 selected a semi-skilled or an unskilled vocation.

So much overlapping existed between the vocational choices of the various ability groups, however, that in spite of the orderly progression of median I.Q.'s, the trends were not statistically significant. Another study of 2,700 high school students disclosed that the median I.Q. of the boys choosing the professions is but seven points higher than that of the boys who have chosen careers in the skilled trades.

Studies conducted at several colleges have shown that college students in various pre-professional and professional courses can be differentiated upon the basis of ability test patterns. This differentiation is of course in part a function of the standards and requirements established by the colleges. Students in law, medicine, journalism and engineering are usually found to have higher mean scores on scholastic aptitude tests than have students in physical education, agriculture, home economics and dentistry. The extent of overlapping is again so great, however, that the conclusion is warranted that intelligence, *per se*, does not always determine vocational choice. The higher the intelligence of the individual, the more likely he is to choose a profession and the lower the mental ability, the more likely he is to choose a vocation from the semi-skilled or unskilled groups. Ability, however, does not have a great influence upon interests.

CULTURAL DETERMINANTS OF INTERESTS

The age, maturational level, sex and physical status of the individual set the limits within which his interests will develop but the specific interests are determined by many cultural influences—national customs and traditions, home experiences and school room experiences. The exact determination of the relative effects of the various factors influencing interests is now impossible but systematic observation shows interests do vary concomitantly with many cultural factors.

The interests of a person are to a great extent formed by conditions in the family and home. If one set of conditions can be called the most influential in the determination of interests, this is perhaps it. The vocational interests of people, as shown by their chosen occupation, tend to be on the same occupational levels as the occupations of their fathers. The discrepancy between a child's occupational choice and his father's occupation narrows as the child ap-

proaches entrance to an occupation. Studies of occupational mobility show that in America, the occupational level of the family tends to remain constant from generation to generation. Traditionally, the occupational mobility in America is greater than it was in pre-war Europe.

In terms of specific occupations, the similarity between the vocational choice of the child and the occupation of the father is dependent upon the occupational level of the father. The sons of physicians are more apt to want to be physicians than are the sons of mechanics to be mechanics. The relationship between the vocational choice of an individual and the occupation of his father also has been found to be dependent upon the sex and abilities of the individuals concerned, the time of vocational choice and the method of determining this choice.

Studies using vocational interest tests given to children and parents and to twins suggest that the influence of the family upon interests is as great as its influence upon other personality characteristics. The sons of physicians tend to have vocational interests similar to those of physicians, as measured by the Strong Vocational Interest Blank. Sons whose fathers are in the skilled trades tend to have measured interests in scientific and technical occupations and sons whose fathers are in business tend to have measured vocational interests in business. Reported correlations between the measured interests of male college students and the measured interests of their fathers range from .00 to .48 with an average correlation coefficient of .33. In one study, rank difference correlations between the occupational scores of the individual father and son pairs ranged from $-.42$ to $+.95$, with a median at $+.66$. The same coefficients for unrelated pairs ranged from $-.56$ to $+.93$, with a median at $+.36$. Little doubt can be raised regarding the existence of a positive correlation between the measured vocational interests of the child and both the occupation and measured vocational interests of the father.

A relationship has also been demonstrated between the measured vocational interests of twins. In a study of 120 pairs of twins, Carter found a correlation of $+.50$ between the Strong test interest patterns of identical twins, a correlation of $.30$ between the interest patterns of like sex fraternal twins, and a correlation of $.26$

between the interests of unlike sex fraternal twins. These correlations are significantly lower than similar correlations involving physical and intellectual characteristics but they do resemble correlations found with other personality and attitude tests.

The familial resemblance of interests is a complex relationship. Factors determining a man's occupation involve both temperament and ability which are basic functions of the genetically determined physiological-psychological organism. On the other hand, the occupation of the family may produce an early atmosphere in which the child is reared and which in turn produces the same interests that are found in the parents, who originally determined the social structure of the home. Regardless of the sources of variation, the conclusion can be that the interests of an individual do vary according to his home and family.

The school is another potent factor determining interests. The teacher in nursery school and kindergarten is primarily concerned in arousing and maintaining the interests of the child and until such interest has been aroused, instruction in formal subject matter is futile. Specific techniques are available for accelerating reading interest, arithmetic interest and penmanship interest. The school is the only place in this society where a systematic and consistent attempt is made to form and direct interests and such attempts are, for the most part, limited to the first few years of a child's educational career.

Instructional techniques can, however, influence interests in older people, including those at the college level. Interest in laboratory courses can be sponsored to such a degree that students will voluntarily spend more time and expend more energy in those courses. Vocational interests can be also influenced in a desirable direction when adequate techniques are utilized. The extent to which vocational interests, as shown by occupational preferences, can be influenced depends upon both the amount and kind of occupational information and experience supplied to the student and the amount of individual time and the type of personal counseling made available to each student in the class. With appropriate classroom and counseling facilities, experimental studies have shown that vocational choices can be made more realistic and students can be influenced

to choose occupations in which their chances for success and satisfaction are greatest.

Children in school have been successfully differentiated upon the basis of their interests. Wyman was able to differentiate grade school children according to intellectual, social and activity interests. Hubbard was able to measure the mechanical interests of junior high school boys. Tyler has developed a test, the *Minnesota Interest Test for Girls*, which can be used in assigning high school girls to academic or commercial courses. Garretson's *Preference Questionnaire* can be used in assigning high school boys to academic, technical or commercial courses.

Attempts to measure the educational interests of college students have proved less successful. Tests are available which are of doubtful usefulness in assigning college students to courses in English, social science, natural science, foreign language, mathematics and education. During recent years endeavors to increase the efficiency of the prediction of school grades have been unprofitable and the development of educational interest tests may assist in raising multiple prediction coefficients.

Individuals differing on the basis of their interests have also been found to differ on the basis of other personality characteristics. The relationship between interests and sociability, emotional stability, radicalism, religiosity, and morale, although not high, is substantial enough to demonstrate the essential unity of the personality. College students interested in banking, dentistry, music and government, as shown by their vocational choices, are economically and politically conservative. Industrialists, bankers, and physicians who have attained observable occupational success, are among the most conservative of vocational groups. Students interested in journalism, law and social work tend to be economically and politically liberal. These liberal tendencies persist in adults who have been working in these fields several years. Students choosing business tend to be more optimistic, less cynical and less critically minded than other students.

Interests as measured by vocational interest tests also are related to other measured aspects of personality. People with interests in social welfare fields on the Strong test (teaching, social work, minister, etc.) tend to obtain high scores on tests of social adjustment, emotional

adjustment and extraversion. People with measured interests similar to those of engineers tend to have low scores on social adjustment scales. Students with measured interests in business tend to show themselves more conservative on various attitude scales, as compared to students who have measured interests in social welfare jobs. Finally, using the Strong Vocational Interest Blank, scales have been constructed providing scores which correlate from .21 to .52 with personality tests of self confidence, sociability, home adjustment, health adjustment and social adjustment.

Interests thus form an integral part of the personality, which suggests that major trends in interests cannot be influenced by relatively superficial experiences. Specific interests, directed toward isolated objects or activities, can perhaps be influenced by these experiences, but those factors determining the general interest patterns of a person form a complex of physiological, maturational and social conditions extending over a long period of time.

IDENTIFICATION OF INTERESTS

For purposes of guidance and research, interests are identified and evaluated in several ways. The first method used for research purposes, as exemplified by Thorndike's study published in 1921, and the most widely used method in guidance today, is one of simple interrogation. The subject is asked a direct question about what interests him. In vocational guidance the initial occupational choice is often used as a starting point in the determination of the subject's important vocational interests. Occupational preferences or choices, however, are very specific and may easily be changed by superficial experiences. Many times these changes are not congruent with the personality of the individual and a boy may not only choose an occupation for which he lacks adequate ability but he may also choose one for which he lacks appropriate interests. A student liking mechanical things and skillful in mathematics and the physical sciences may choose teaching as a profession because that is his father's occupation, whereas his chances of achieving success and satisfaction may be much greater in a field related to engineering. Because of the transiency of vocational choice and because of frequent disagreement with more fundamental personality structures, this expression of interest

can seldom be used alone and is useful only when evaluated in the light of other information.

The achievement record of the individual, as shown by test scores, successes and failures in school, on jobs, and with hobbies, offers another indication of interests. This is a fallible index, however, because success in every endeavor is due not only to interest but also to factors related to ability, training and available opportunities. Because of a fertile set of conditions, a man may achieve outstanding success while having little interest in what he is doing. Similarly, a person with great interest in an occupation may fail at it because the conditions surrounding him do not permit him to succeed. The mortality rates in universities and professional schools demonstrate that interest alone cannot produce success. Many students of mediocre ability show a genuine interest in becoming physicians but their limited abilities prevent them from even being admitted to a professional school, to say nothing of successfully completing the course of training. A boy interested in athletics may never make a school team because of inappropriate motor skills and physical development. For these reasons, interest can be regarded as only one of the many possible factors involved in success and failure and more is needed than this if interests are to be accurately identified.

Many psychological instruments have been devised or adapted to identify interests. Most attention has been paid to problems of vocational interest. The instruments used include word association tests (Wyman and Terman), differential information tests (Flannigan), learning and memory tests (Super) and interest inventories which obtain reactions to specific interest objects (Strong, Kuder, Cleeton, Thurstone). Most of the research has been done with the interest inventory type test and the most widely used interest inventory is the Strong Vocational Interest Blank.

Based upon the early work of Ream, Craig, Freyd, Miner and Cowdery, the Strong test, first published in 1926, has been developed by Professor Edward K. Strong, Jr., of Stanford University. The items of the test offer the subject an opportunity to express likes, dislikes and preferences for various occupations, amusements, recreations, activities, school subjects and personality characteristics. Separate forms of the

test are used for men and women. For the men's test, scoring keys are available for 38 occupations, and four non-occupational keys have been published. For the women's test, 18 occupational keys are available and one non-occupational key.

In developing the scale for a given occupation, the test is administered to a representative sample of successful men in that occupation. The percentage of people in that occupation who check a certain answer to an item is then compared to the percentage of people in the general population who check the same answer. For example, the first item of the test asks a person to check whether he likes, is indifferent to or dislikes the occupation of actor. Of all the 513 engineers given the test, 9 per cent answered they like the occupation of actor while of the general population, 21 per cent checked they liked it. In this case of the engineer's scale an answer of *like* is given a negative weight, the size of which is a function of the size of the difference found between the group of engineers and the general population. In this way three weights are found for each of the items and this is done for every scale to be constructed.

Using these weights, total scores, obtainable through hand or machine scoring, are found for each scale. The raw scores are converted to standard scores and presented upon a test profile. The patterns of scores so obtained reveal an individual's interests in relation to the interests of groups which have been successful in various occupations. A person receiving a high score, i.e., a rating of A, B+, or B, on a scale for a given occupation, is much more like men in that occupation on the basis of his interests than is a man selected at random from the general population. From the test scores he can conclude that he bears a marked similarity to men who have been successful and who have persisted in certain occupations.

Scores obtained on the Strong Vocational Interest Blank have both relevance and stability. Follow-up studies conducted over several years have shown that:

Men continuing in an occupation for nine or ten years on the average obtain higher interest scores in that occupation than in any other.

Men continuing in a given occupation obtain a higher interest score in that occupation

than men entering another occupation obtain on that scale.

Men continuing in an occupation obtain higher scores on the associated occupational scale than do men who change from that occupation to another.

The test has not been shown particularly useful in predicting degrees of success when only successful men are studied. It has been shown to predict relative success in some fields, including life insurance selling. It also has a slight predictive value in regards to school grades. In general, the test appears of much less value in differentiating the relatively more successful from the less successful than in differentiating the successful from the failures, although conclusive evidence is not yet available regarding this.

Interests as measured by the Strong test are stable enough to be used in guidance. The reliabilities of the men's scales vary from .73 to .94. Over a period of 5 years, the correlations between test and retest range from .59 to .84 and over a period of ten years the correlations range from .51 to .83. Although small, systematic changes occur in interests with increasing age, these changes are not great enough to vitiate the usefulness of the test.

Whereas the Strong test is the outstanding example of an empirically developed vocational interest test, the Kuder Preference Record, developed by J. Frederic Kuder, is the outstanding example of a vocational interest test which has been constructed upon a rational, rather than an empirical basis, and later empirically standardized and validated.

The psychophysical method of paired comparisons was used in the development of this test. The first form of the test consisted of forty groups of five activities. The subject ranked the items in each group in order of preference. Thus, in ranking the five activities, the subject had to compare each activity with every other activity in the group, consequently indicating ten preferences. The forty groups in the blank produced 400 preferences. The blanks were then scored for preferences for a number of types of activities. Some responses were interpreted as indicating a mechanical preference and were scored accordingly. Others were interpreted as indicating a literary preference and were so scored. In this way tentative scoring procedures

were developed for several areas—business, science, music, athletics, social prestige and annoyances.

The items were then analyzed and revised and reselected and the first finished form of the test was published containing scales which provided scores in seven different areas and with reliabilities ranging from .61 to .93. The most recent form of the test has added two scales. After the scales were developed, the test was administered to adults in different vocations and to students in different curricula. In this way, the validity of the test was determined. Commercial airplane pilots were found to receive their highest scores on the mechanical scale; writers received their highest scores on the persuasive and literary scales and nurses received their highest scores on the social service scale.

The essential difference between the above two types of interest tests is that in the case of the Strong test, the scores assigned to each response were originally assigned upon the basis of the responses made by occupational groups. In the case of the Kuder test, the scores were originally assigned upon the basis of the decisions of judges and later the results of these judgments, or total scores, were compared to the scores of occupational groups. In each case, a test is produced which is capable of differentiating occupations and measuring vocational interests with satisfactory reliability.

The interests measured with different techniques are not the same thing, as is shown by the far from perfect correlations found between various indices of interest. The intercorrelations between seven different interest tests of varying validity and reliability range from — .03 to + .74. Correlations between the Cleeton Interest test and the Strong test range from — .16 to + .68. The correlations between Strong test scores and scores on a preliminary interest scale based on differential remembering were of the same order. Interests as expressed by occupational choices also bear a limited relation to other expressions of interest. A contingency coefficient of .50 was found by Darley between vocational choices and scores on the Strong test. Strong found that of 156 college students, 46 per cent entered the occupation in which the highest interest score was obtained; 26 per cent entered the occupation of the next highest score; and 18 per cent entered an occupation in

which no interest was shown by the test. Different measuring techniques reveal different kinds of interests; and an interest revealed with one scale may not appear when a similarly labeled scale of another test is used. A greater resemblance, however, is found between generalized personality patterns found on different tests than between specific interest scores. These patterns are of greatest usefulness in individual counseling.

APPLICATIONS OF INTEREST MEASUREMENT

Interest tests are widely used by clinical psychologists. Educational interest tests are used in helping students select appropriate curricula. Vocational interest tests are used for purposes of vocational guidance and rehabilitation, employment and selection, college admissions and counseling and industrial upgrading and placement. During the five years preceding 1944, one of the largest university personnel and counseling agencies in the country administered 10,334 vocational interest tests exclusive of several thousand tests administered for purposes of college admissions and college counseling programs in the same university. Many thousands of vocational interest tests are being given in the rehabilitation programs of the armed services, both to men and women in the Army, Navy and Marine Corps.

In interpreting vocational interest tests, counselors make use of the concept of occupational hierarchies. During the first world war, psychologists found that jobs of men in the Army could be arranged in order of the average intelligence of the men in these occupations. Thus, near the top of the list were various professional occupations—engineering, law, etc., and near the bottom were relatively unskilled jobs—teamster, factory hand, etc. This occupational hierarchy based upon intelligence agrees closely with the occupational hierarchy based upon the Occupational Level scale of the Strong Vocational Interest Blank. Later the workers of the United States Employment Office, following the leads offered by Trabue and Dvorak, found that jobs could be arranged in terms of the more specific abilities possessed by the people in these jobs. Some jobs were closely related to certain other jobs and if a person had adequate ability for one of these jobs, he would probably have adequate ability for the others.

Occupations have been found to arrange

themselves into families also upon the basis of the vocational interests of the people in these occupations. This was first forcefully demonstrated by Thurstone in his factor analysis of the Strong Vocational Interest Blank in 1931. Through multiple factor analysis, he showed that four factors could be identified in the test and that the amount of each factor represented in each of 17 occupational scales varied. On the basis of this variation, the occupations could be divided into occupations involving work with science, with language, with people and with business. Included in the first group of occupations are medicine, architecture, and psychology. Included in the second are law, journalism and advertising. In the third group are teaching, ministry and personnel work and in the last group life insurance salesmen, real estate salesmen, and purchasing agents. As new scales have been constructed for this test, later analysis has disclosed that all occupations cannot be adequately described in terms of Thurstone's four factors and certain jobs still remain relatively unique insofar as the interests possessed by people in those jobs do not closely resemble the interests of other occupational groups so far studied. For example, the correlations between the scale for certified public accountants and the other occupational scales of the Strong Test indicate this occupation does not fit well into any of the job families described.

The assumption of occupational families has been made in the construction of the Kuder Preference Record and the occupational titles themselves are not used at all in the presentation of test results. The scores are in terms of mechanical, computational, scientific, persuasive, artistic, literary, musical, social service and clerical interests. From these scores the inference is made regarding interests in specific occupations.

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JUNG, CARL G.—Carl G. Jung, the world-renowned Swiss psychotherapist, teacher and writer on psychological topics, was among the pioneers in so-called Depth Psychology, ranking with such men as Janet, Freud, Adler and Prince. An early participant in the psychoanalytic movement, Jung introduced some of its leading concepts and was the first president of the International Psychoanalytic Society, from which he resigned because the group was dominated to a constantly increasing degree by doctrinaire, Freudian pansexualists in later years. Among other psychological concepts, introduced by Jung, and later used by Adlerian Individual Psychologists and by Freudians as well as by Jung's followers, the Analytical Psychologists, is the concept of the psychological complex. Jung defines a complex as a group of associated ideas, or response tendencies, sharing a common emotional tone and having common psychogenic roots. This concept is among the pivotal ones in the Jungian system and, indeed, sometimes Jung calls his whole viewpoint "Complex Psychology," reserving the term Analytical Psychology for his therapeutic technique.

Jung devised the discrete-stimulus word-association method as a technique for detecting and exploring complexes in the individual psyche. This method consists of presenting to the subject, or patient, a number of words after instructing him to respond to each by immediately uttering any word that first comes to mind after the stimulus is presented. Sometimes a hundred verbal stimulus-response sequences may be recorded and analyzed, and sometimes several hundred are required. Jung has developed several lists of stimulus-words to be used for seeking complexes. These word lists, however, are of two main types. One type consists almost entirely of words which have an emotionally neutral significance for most persons. Another type includes very many words which often provoke emotional responses. Jung considers the content of an individual's responses to the stimulus

words to be significant but other factors, such as the timing, the accompanying gestures, involuntary movements and so forth, are considered revealing, also. Slow responses to particular words, responses having an unconventional content, deliberately changed responses, responses accompanied by notable expressive movements and other types are checked as possible indicators of a psychological complex. Later, the relations between the various indicative responses are investigated and a tentative construct, representing the complex, is formulated. This construct is considered to be a hypothetical representation of the complex which must be checked by further observations of the patient's responses in clinical situations. This general method has been widely adopted by clinical psychologists and mental hygienists who are interested in investigating individual eccentricities of many kinds but who are not associated with any school of depth psychology. Many American academic psychologists have endorsed the discrete-stimulus method as a device to assist in personality analysis, and more particularly in the analysis of the neurotic.

Jung also accepts the concept of psychological symbolism. He believes that some dream contents may be symbolic, and he has done much pioneer work in the symbolism of folk myths, of religious rituals and of art. He also stresses the analysis of individual fantasy-productions and expressive drawings or paintings. Jung's views regarding symbolism stand in striking contrast to the Freudian view. For example, Jung strongly repudiates the notion that any particular image may have an identical symbolical meaning in the productions of different individuals. He regards emotive meanings as highly personalized and emphasizes the principle that any symbol must be interpreted with reference to its total symbolic context and, indeed, with reference to the yet broader matrix of individually meaningful behavior in general. This principle Jung calls the principle of "Amplification." In seeking to amplify the immedi-

ate reference of a symbol, Jung always considers not only the momentary context, but also the temporal context. He relates the particular symbol with symbolic productions by the same individual in the past, and he also asks whether the momentary symbolic expression has a "perspective" significance for the subject's future adjustments.

Perspective analysis has always characterized Jung's work and differentiated it from other approaches to the so-called unconscious mind. Indeed, he first became interested in depth psychology in 1898 when he studied a case in which one segment of a split personality seemed to anticipate the future, re-integrated self. Jung considers many neurotic episodes to be essentially crises of development. He occasionally has asserted that even regressive episodes in which immature habit-patterns are re-activated must be interpreted as preliminary stages in an attempted advance toward adjustment which shall be more adequate than any that has characterized the particular personality, prior to the regressive episode. Many of his interpretations are, therefore, finalistic and teleological rather than reductive and mechanistic in character. The principle of the "autonomy of the psyche" is stressed throughout the whole system and Jung repudiates all merely biologicistic approaches to psychology. He believes that the psychic cannot be reduced to biological categories and that the biological cannot be reduced to physico-chemical terms. Higher levels of functioning obey the laws of lower levels but they also exemplify higher laws which are irreducible.

Jung does not believe that the same psychotherapeutic methodology is applicable to all patients. He distinguishes between the introverted type and the extroverted type. The introvert may adjust happily to his world only on the basis of a personal philosophy, or a religious orientation, or some other functioning world view. The introvert demands a high degree of coherence in his interpretation of his various problems and of their relations to his environments, including even the total cosmic environment. The extrovert, on the other hand, may attain adjustment on a more pragmatic or positivistic basis. If he is given the opportunity to function in socially acceptable ways, and can win commendation while at the same time releasing his biological tensions, the extrovert may

be happy without considering the cosmic relatedness of his own behavior. For Jung the whole distinction between the types is methodological for psychotherapy and is also a relative distinction since he has found that only a very few patients are pure introverts or pure extroverts. Jung has never asserted that the introvert is necessarily a socially maladjusted individual. He has never associated neuroticism with introversion as defined according to his system. On the other hand, he has never defined the extrovert as being emotionally trivial or intellectually inferior. These misinterpretations of Jung's views have gained some notoriety, however, especially in the United States of America where simple, behavioristic philosophies of psychology have had the greatest vogue in the recent past.

Clinical observations have led Jung to the conclusion that in any personality either thought, feeling, sensation or intuition is more highly developed than are the other three functions. Thus he speaks of an introverted feeling type, an introverted thinking type, an extroverted intuitive type, an extroverted feeling type, and so on, through all the possible combinations. Functions which are undeveloped in the conscious personality, however, may undergo unconscious development. Thus a person who overtly exemplifies the extroverted sensation type might possess certain latent introverted intuitive capacities. Indeed, Jung affirms that a dialectical relationship usually obtains between the conscious orientation and the unconscious set.

The most widely rejected Jungian theory is the theory of the "Collective Unconscious." Jung teaches that every symbolic production must have a certain significance arising from a personal unconscious and yet simultaneously must have a deeper, collective meaning. In the analysis of the individual Analytic Psychologists explore first of all those associations which illuminate the personal levels of the psyche, and then, as a second but decisive stage in the analysis, they try to detect connections between expressed contents and the internal collective heritage. These conceptions, unusual in the context of twentieth century psychology, first occurred to Jung when he noted the similarity between the fantasy-productions of certain neurotics and the content of folk-myths. Personal rituals and ancestral folk-rituals were also found

to be similar in many cases. Jung also believes that more basic than any particular ancestral heritage is the "libido," a really universal, purposive life force. Individual lives are differentiations within that universal stream; racial groups, too, are considered as differentiations, but the latter are more inclusive. As the individual psyche is progressively analyzed, less and less personal areas are reached, and each successive area contains contents which are more universal than are those of the more accessible strata. Thus the "libido" may be individualized in substance, but in kind it is universal. Sometimes Jung speculates, with the Hindu philosophers and with the German Idealists, that individuation itself may be a superficial and perhaps partly illusory process.

In the analysis of the individual Jung first of all investigates the nature of the overt, highly socialized aspect. This aspect of the total personality usually represents a compromise between the conventional sanctions and the ego-interests. This most superficial, readily accessible aspect he calls the "Persona." As a second step Jung explores the "Ego," which is only partly socialized and which may be represented schematically as overlapping the boundaries of consciousness on the one side and the unconscious mind on the other side. Unconscious ego-contents are purely personal, representing repressed episodes in the personal life history. Further analysis always leads toward the revelation of the collective unconscious, and the "Shadow" self stands on this deeper boundary. The "Shadow" system rejects many ego interests and ego ideals. Its tendency is anti-social, sometimes even criminal, and yet is not merely egoistic. It is not only more regressive than the ego system but may have characteristics which can only be suggested by employing such terms as "diabolical." Demonology, both religious and merely esthetic, is considered by Jung to be in some degree a projection of the "Shadow." The devil image is a true "Archetype" of the collective unconscious.

The "Animus" and the "Anima" are also archetypes. The "Animus" is an unconscious mate-ideal in the female psyche and the "Anima" is an unconscious mate-ideal in the male psyche. However the significance of these images is much richer than just that. Closely related to the "Animus" is the ideal of the "sage," or "famous wise one," and closely re-

lated to the "Anima" is the ideal of the "Great Mother." Both the male psyche and the female psyche are said to contain both major archetypes. But the relation between specific archetypes and the personal unconscious differs in the two cases. Thus Jung believes that the sage ideal may become an ego ideal for the maladjusted man who is striving toward wholeness of personality, but that it would not become an ego ideal for a sexually normal woman. The precise nature of these and other archetypes varies in different racial groups, and Jung does not think of the archetypes as being inherited as concrete forms. Rather, certain potentialities for archetype formation are inherited. Thus even the collective unconscious may be personalized in some measure, as the experiences through which the potentialities are realized may differ radically in different life histories. Nevertheless Jung considers the possibilities for personalization to be definitely limited by the character of any specific collective inheritance.

Jung stresses the role of religion in personality development and adjustment. He states that a high percentage of maladjusted adults would not have become seriously neurotic could they have developed an intellectually respectable affirmative world view. Also, the development of an intellectually and emotionally satisfying personal religion is considered an essential aspect of the therapeutic process in many cases. The finally achieved "self," the end product of that process, is felt by some patients as being an introjection of supramundane values. As a psychologist Jung accepts no particular creed or doctrine but he is strongly convinced that, by and large, humanity requires religion, and that personal maturity in the majority of cases includes satisfactory adjustment to a cosmic setting which is conceived in spiritual terms in the last analysis. That only a small minority, those being, of course, extreme extroverts, may achieve and permanently maintain fullest integration and utmost joy in living without some at least quasi-religious orientation toward their most universal environment is Jung's firm conviction, based on a lifetime largely devoted to clinical work and field observations of human behavior. This viewpoint is still a minority one in modern psychological circles, but there is now a definite trend in that direction as the more naïve mechanistic and reductive views are re-

pudiated by a psychology which is rapidly approaching methodological and philosophical maturity.

Jung's philosophical position stands somewhere between pure vitalism, on the one hand, and holism or organismalism, on the other. Self-knowledge he regards as the completion of a "phenomenology of the psyche." This viewpoint may be criticized, since the deeper psychic strata could be known only through inference and not through direct phenomenological exploration. The term Integral Phenomenology may be applied to the systematic exploration and description of personal worlds. Likewise, the continuum of expressive behavior may be said progressively to reveal a personal world if the continuum be adequately interpreted within a non-physicalistic, phenomenological universe of discourse. But the psyche always transcends direct experience and appears in no personal world. It is not introspectively known, nor does the exploration of another's personal world reveal it. The psyche is "known" only through constructive inference from the data of a personal world, and therefore is a conceivable metaphysical entity which may, or may not,

actually exist. The question is a philosophical one. Therefore, while the term Integral Phenomenology has an evident methodological validity, Jung's usage of the term "Phenomenology of the Psyche" may be questioned on methodological and logical grounds. Theories about a finite psyche, or about an infinite psyche, (and Jung seems to accept both types of theory) are metapsychological theories and, in a more general sense, belong to that part of systematic philosophy which traditionally has been called "metaphysics."

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LANGUAGE AND PSYCHOLOGY.—

"There is at bottom very little difference between men," said the old carpenter whom William James was fond of quoting, "but what little there is, is very important."

To observe and to understand—and thus to formulate laws which may serve as bases of prediction and which must necessarily be revised again and again as the horizons of observation and understanding expand—the "very little difference between men" has been the business of psychology since first it interested itself in the problem of "the personal equation." To this problem it owes its identity as an autonomous science, and its prestiges have been heightened or lessened in accord with the measure to which it has illuminated and provided clarifying hypotheses regarding one or another aspect of the equation.

We propose here to report on some of the ways in which psychology has employed "language" in the delineation of "personality." We have set aside for a different context (4) the "language" of the mathematician and the natural scientist and thus, also, the linguistic customs and usages of psychologists in the formulation of problems and the evaluation of results (3).

In mathematics and the natural sciences—whose business is primarily the "external realities"—conceptual, pure, logical thinking has to maintain itself against the phantasies, dreams, myths and ideologies, and imagery which are embedded in the linguistic usages and customs of non-scientific thinking. The circle, the triangle, the sphere, number, force, matter, the atom and so on attain full and exact scientific meaning precisely because logical thinking rigidly excises all "inner realities." The linguistic cloak of mathematics and the natural sciences is, as Vossler (61) notes, pronominal not nominal; it points and refers to things; its mood is imperative; its tenor is copulative, equational, operative, executive. The linguistic cloak is conventionalized so as to avoid confusion. Itself,

it is otherwise irrelevant. Jupiter is not a planet as it is to us who are not astronomers; the astronomer's thinking about this particular planet is not befuddled by visions of the antics, the wrath and the amatory, predacious excursions of this phantom of mythology. The planet Jupiter could just as easily have been given a number or a letter. The accent, in these sciences and mathematics, is on the conative. They have freed themselves from an equation of "inner" with "external" realities; they have defined their meanings or goals with reference to the latter and have envisioned some of the obstacles or frustrations; and are now prepared to carry out, to operate, to execute in order to attain the goals.

Not every scientist nor every mathematician frees himself completely from personal phantasy in the execution of his scientific premises. Since complete freedom is a *sine qua non* of the natural sciences and mathematics, it might easily constitute an index of greatness in these fields. Any revolutionary discovery will reactivate personal phantasy and the sometimes easy, sometimes difficult process of excising must be experienced before conceptual, pure, logical thinking is again attained. One has only to review the history of science's reactions to the discoveries of Galileo, Copernicus, and Einstein to obtain innumerable illustrations. Cremonious, for example, would not look through Galileo's telescope lest what he might see might be contrary to what he felt he should not see.

The personal phantasy that realizes itself in the subject-matter of mathematics and the natural sciences is irrelevant in this context. It is important to note, however, that it receives expression in extra-scientific outlets—politics, literature, poetry, economics, psychology, music, drama. If the criteria of conceptual, pure, logical thinking are imposed likewise upon enjoyment of or participation in these media, which involve people not merely atoms and so on, it is easy to surmise—after careful investigation—that these expressions are spurious and simply the

broken threads off one personal phantasy. In such instances, the inner language (61) has not been negated and the linguistic cloak of logical thinking is merely the device whereby it is hoped to eradicate the paradoxes and contradictions of inner experiences and thus to create "order" out of chaos. I have recently been informed by a scientist whose interests are spread over philosophy, physics, and semantics that the earth will cease to move in something like five billion years and that psychology must adjust its thinking accordingly. This observation seems to me to be relevant only for the problems and the subject of the sciences which noted it. Extension of this observation and others not so far distanced to problems of personality is predicated on an illusion—the tremendous strides made in the physical sciences and mathematics lead some to believe that they have created facts, that there was chaos, too, and contradictions and paradoxes in the external realities before a men-made order dispelled them. Seemingly, the elements in nature were neurotic and perverse until men beat upon them with their "conceptual, pure, logical thinking," just as the Chinese successfully ward off the coming of a comet for two thousand years by beating nightly upon gongs.

Some people are wont to express surprise over the "naïvetés" of the pronouncements on extra-scientific matters by eminent scientists or over the whimsies of a Lewis Carroll. They expect authoritative statements, free from doubts and uncertainties and from personal bias, in which a always equals a —in which there is no dialectic. They are disappointed because the "naïvetés" and the "whimsies" do not provide freedom from their own doubts and uncertainties and do not express their own personal biases and dialectics. They forget—or do not know—that in the exact disciplines that Venus, for example, is not noted to have certain operations simply because of prejudice towards the nominally male planets. They forget—or do not wish to know—because they do not wish to realize that men are often pro-this because they are anti-that or anti-this because they are pro-that. The linguistics of the "pure" sciences is adapted to the needs of the situations in which they are pursued. The linguistics of men are likewise adapted to their needs; perhaps in five billion years the two will meet.

"The need for authority," says John Dewey

(16), "is a constant need of man. For it is the need for principles that are both stable enough and flexible enough to give direction to the processes of living in its vicissitudes and uncertainties." Six little words seem to take up all man's day (61): "I should, I must, I can, I shall, I will, I may." But he knows not "What I should, I must, I can, I shall, I will, I may." Too many psychologists would refer man for instruction to the linguistic systems of the exact, pure sciences. Korzybski's theories—if not his practices—find the seat of authority in the new orientation in physics (53). The how's and why's of man's behavior and the devious ways in which they are predicated on the what's are dismissed as irrelevant. Yet what, how, and why are questions which are posited by even mathematics and the natural sciences. In solving the riddle of "the personal equation," too many seek to make the answers mirror the operations noted by the science (or sciences) which first presented psychology with a problem it could make uniquely its own.

Obviously, it behooves psychology to eradicate or at least to be less ignorant of its own personal equation in the study of "the very little difference between men." How to do this is a problem in the language of psychology. The writings of Carnap, Bridgman, Bloomfield, Morris, and Stevens are significant in this context, but are irrelevant in the context of "speech and personality," (53) where one should be able to presume that the investigators are already acquainted with the problems presented to psychology by logic and epistemology. The studies of the many implications of the "halo" effect and Ferenczi's (17) *Belief, Disbelief, and Conviction*, among many others, would be more helpful.

Psychology seems to equate forms with internal and external realities. It fails to note that the linguistic economy of the sciences it idealizes was factored out by the experiences of men who were scientifically curious about phenomena whose time-space-pace and other relations differ from those of men. Psychology cannot eradicate its own biases merely by delimiting the scope and depth of its observations or by parroting an argot. Baggally's (9) application of quantum mechanics to "hedonic conflict and the pleasure principle" does not advance the study of personality even though—with reference to certain equations—he says: "It is my

opinion that we have here the explanation of the primary sadistic impulses directed against the mother . . ." The language of topology even detracts from the intelligibility of its otherwise cogent scientific observations. No amount of mathematical virtuosity in delimiting and parroting will alter the fact that scientists operating in the pure sciences have no need for metaphors, elisions, ellipses, synecdoches, for adjectives and adverbs, for nouns and personal pronouns, for monologue and dialogue, for moods and drama,—and that men do.

The exact sciences, as noted, attained conceptual, pure, logical thinking attained chastity by eliminating personal phantasy, dream, imagery, myth and ideology. They could then cognize in unprejudiced fashion and thus evolved many theorems which were to be tested. The accent, as already noted, was on the conative.

We now come to an aspect of the investigation of speech and personality in which the accent is on the cognitive. The problem of personal phantasy is eliminated either by considering any deviation from the communal phantasy as pathologic or by categorically insisting upon the adoption of one or another communal phantasy. The approach is normative. This is ingeniously—by reference to the etymologies of words—and ingeniously disguised; so much so that we can only quote at some length from Galt's article on *Our Mother Tongue* (24), in which he attempts to show that the "body of linguistic data" massed by Burrow's phybiological researches "correlates nicely with the phybiological orientation."—

"An important aspect of Burrow's thesis is his altered orientation in respect to the 'good-bad' or 'right-wrong' antithesis that everywhere pervades the sphere of human behaviour."

"Their external manifestations may be quite diverse but the internal behavioural mechanism is the same. Whether bad or good, the individual is reacting momentarily in the way he reflexly feels is more advantageous to his 'social image' of himself. The moral course which an individual will follow is thus entirely variable and arbitrary."

"Accordingly, the primary motivation of man is not expressed in the desires, wishes or phantasies of the individualized self but is basically oriented in relation to the needs and integrity of his biological group. In man's socio-sym-

bolic development, however, there has occurred a biological trauma in which the individual has been split off in feeling and motivation from his phyloorganismic matrix. The part (individual) has inadvertently received more stress than the whole (species), and this unwarranted emphasis has resulted in a false splitting and individuation within the behavior-processes of man as a biological unit or phylum. This divisive substrate issues in a systematized distortion and symptomatology analogous socially to the distortion and symptomatology that is induced in the neurotic or psychopathic patient by a cleavage within his total personality as an individual."

"*Das Kind*, German for 'child,' signified in its original, broader meaning one's *kind*. The child was not looked upon as a new personality belonging to a specific individual; it represented an intrinsic member of a generic group."

"The group solidarity of original man is further evidenced linguistically in the findings of the comparative philologists who point out that the languages of many primitive peoples have no word for the first personal pronoun of the first person singular. To quote from Dr. Margaret Schlauch's very interesting book, *The Gift of Tongues*: "There is reason to believe, indeed, that the first person pronoun (singular) was a comparatively late development in some languages. This is vivid grammatical testimony to the relative unimportance of the individual as opposed to the tribe! It seems to imply that in such tribes men could conceive of themselves only as parts of a larger social whole. In such cases it was not possible to say 'I do this,' but something like 'People do so-and-so by means of me, John.'"

"Knowledge is ulterior, consciousness strategic. Cognition is close kin to pride. It is one with *self* as an end. In other words, it is synonymous with acquisition, aim, calculation. Man has in truth made an *idol* of the *idea*, the two being in fact closely related etymologically."

"The distrust of the folk-mind for the word and the symbol, for mentation and knowledge, is clearly shown in certain Biblical references as well as in certain etymological relationships. Take the word *knowledge* itself. According to Biblical tradition the Fall of Man was brought about through his having 'eaten of the tree of the *knowledge* of good and evil.'"

"The result is that language as now used by

man is not merely an evasion of man's commonness but actually favors the expression of neurosis and war."

Phantasy, dream and imagery, myth and ideology (vide the etymological citations) are rampant in this purportedly systematic approach to the study of personality. "The purposes of language, of course, is communication." "Its development has been a potent factor in man's survival." It is a "somatic function," "produced through the action of definite body-parts." Hence the perturbation over the intrusion of the self, cognition and experiential content and values—these Burrows as a psychiatrist can not dismiss as summarily as Watson did! Hence the nostalgia for the Past, the placing of the norm in phylogeny and not in ontogeny!

In this context, where the accent is on the cognitive, it is easy to trace the intrusion of phantasies evolving from Descartes' "I know; therefore I am" and Kant's "I ought; therefore I can." It is not surprising then that the sole function of language is communication and that the rich experiences of men embedded in language are reduced to a particular scale of meanings (lexicon) and to a particular scale of linguistic habits, traits, and style (grammar),—all of which proves neither that "I am" nor that "I can." Communication is conceived as "produced and forged by the social environment (3)" which provides the individual with a made-to-order logic in the form of a grammar and lexicon. Ignoring the experiential content of the individual, especially in the case of subjects whose native-tongue is English, creates a dilemma in interpretation and evaluation of results—the English language, whose lexicon is the largest of all lexicons and whose grammar is notoriously vague, has always sacrificed "logic" and vocabulary where the logic of facts or of the exterior world disagreed with the logic of grammar (5).

The origin of this approach in comparative philology may be traced to what Jespersen (35) calls "eye-philology." This philology ruled almost exclusively until the early nineteenth century. It evolved around the teaching and usages of Latin. Latin was taught chiefly as a written language, not as a means of opening up a rich store of literature to the masses, or even to the elite, but as a practical and highly important means of communication between educated people. One had to read and write—and speak

it as if one were reading or writing—if one wanted to maintain, however humble, a position "in the republic of learning or in the hierarchy of the church." Its grammar was regarded not as a set of observed facts but as rules which must be observed and obeyed. Its vocabulary was treated in like manner. The usages of grammar and lexicon were intractable and invariable. Their logic was given as corresponding to some order in the universe. The teaching of Latin was *normative*—questions regarding behavior and thinking were settled by whether or not they conformed with Latin usages. Not only thought but all the nuances of experience were considered as coextensive and commensurable with language.

This normative, prescriptive, restrictive view of language was extended to French. As Vossler (61) notes: "In the centuries of Descartes and Voltaire the whole language was intellectually refined and trained to that type of hearing for which *entendre*,"—"to think properly, to know"—and no longer *ouïr*—"to hear"—was the correct term. Vaugelas, the great master of language of that time, says: "that it is much better *satisfaire l'entendement que l'oreille*, wherever the demands of the ear do not coincide with those of the rational intelligence."

Piaget's monumental works are embedded in such traditions. They are mainly concerned with the *thinking* of children over four years of age and are based on observations, conversations, and experiments at the Maison des Petits. Piaget argues, among other things, that the child up to seven or eight years of age is non-social and non-egocentric and thus he commits errors of syncretism (causal relation of two unrelated phenomena) and transduction (inference from one instance) and that it is essentially different from that of the civilized adult in that it is animistic and in other ways similar to primitive man's.

Rose Chadwick notes that Piaget generalized from too few cases and suspects a significant number of the children were below average in intelligence. Susan Isaacs (48), experimenting with children from under three up, gives a wealth of illustrations to show how acutely and perseveringly children puzzle out solutions to *their own problems* and demonstrates that the child's thinking is not fundamentally different from that of adults—it only seems so because there are so many more fields in which his

knowledge is inadequate, and even an adult's thinking may be syncretive and transductive in situations where he does not have the requisite knowledge. Burt, writing some years ago, declared that he found no evidence of any specific mental processes that could not be performed by a child of seven—that there is no age limit in relation to the processes of thinking, beyond that imposed by lack of experience. Piaget's theory, according to Hazlitt, implies that children under seven are scarcely capable of thinking. Hazlitt notes that the adult makes the same mistakes as the child when he is confronted with wholly unfamiliar material; he even makes mistakes with familiar material if he has not been obliged to concern himself with it previously. For example, Piaget tells how children, in accounting for the displacement of water by objects of different size and density, sometimes give weight and sometimes size as the cause without bringing the two into relation or seeing any difficulty in giving different causes for the same phenomenon. Hazlitt obtained the same results with non-scientific adults, who were no more disturbed by the contradictions in their answers than were Piaget's children. Hazlitt questions further two assumptions, which Piaget himself admits in different contexts are not justified, upon which are based "obviously false conclusions,"—thinking can be identified with ability for verbal expression and that the content of thought is indifferent to the process; for instance, if a child cannot think a relation in regard to one subject-matter, he cannot think it in regard to another. And finally, Piaget's assumption that children are naturally non-social in their thinking until the age of seven or eight has been and is still questioned by psychologists, as well as by psychoanalysts and educators. Baldwin and Stecher, for example, note social conduct and a degree of cooperation among children as young as two years of age in circumstances favoring and giving ample opportunity for it. They stress, however, that very few children under five, and even fewer under three, have such opportunities, which can come only to the child who is with others of approximately the same level of development.

Piaget's *satisfaire l'entendement que l'oreille* biases are acceptable to behaviorists in both the psychology and language camps. His precise equational formulations embrace only sign and

referent—thinking and language are reduced to the mechanical and automatic level of the speech of a parrot. His rationale excludes both referent and referee. His "society" is the bleak *Maison des Petits* and the scholastic traditions embedded in its curriculum; the "code" of this "society" over-evaluates verbal expression as a measure of thinking and exaggerates the logicity of adult thought. His isolating of one sign from so many others determines the subject matter and defines the method of his investigations. Thus, he can easily derive generalizations regarding the emergence serially of thinking in linguistic habits and forms, each one unique and invariable in function and content. These generalizations, though admittedly falsely premised, are utilitarian; they apparently fulfil a need for something as fixed in the universe of men as is found in the universe of nature; moreover, they have the semblance of having evolved from "conceptual, pure, logical" thought. And all these enable the behaviorist to suspend his disbelief of cognition and his aversion to its irrationalities.

The bibliographical reviews of Esper (16a), Adams and Powers (1a), McCarthy (1a), McGranahan (1a), and Sanford (53), all endorse a behavioristic treatment and explanation of the problems of language—regardless of whether the problems relate to the language of psychology, the psychology of language, or language and personality; all endorse further Piaget's evaluations as the strategic point for either inquiry or interpretation or both. The implication of these endorsements, as I have indicated in other contexts (3), is manifold: they over-evaluate scientific method or technique to the exclusion of scientific temper or spirit—facility of verification guides the selection of facts and predetermines their relevance, not a certain humble devotion to the subject matter, be it the behavior of natural universe or of men. Moreover, the reviewers utilize as "proofs" or "disproofs" of their premises the results of investigations otherwise premised. They fail to heed a caution in literary criticism which should be applied in scientific criticism:

"In every work regard the writer's end,
Since none can compass more than they intend."

Thus it is that "the style is the man" becomes the slogan in studying speech and personality,

in Gestalt and topological psychology as often as in behaviorism. The style is no more the man than an electrocardiogram is a man's heart or a recording by Frank Sinatra is Frank Sinatra. The style is the man only if it is presumed that he does not see, think, feel and judge—and act, even though it be in the form of an inaudible retort or a shrug of the shoulder—as he listens to others, that he does not hear, think, feel, judge and act as he reads or writes, and that speaking, reading, and writing are self-contained, not reflections of the form and content of orientation to a situation.

Gardiner (25) recognizes that the style is not the man when he draws an arbitrary, artificial distinction between language and speech:

"New combinations of words, newly coined words, new uses for old words, as well as such terms as intonation, rhythm, emotional and affective factors, personality traits, all operate to make of speech a living, ceaselessly changing thing rather than a collection of stereotyped sounds. If any speaker repeated a sentence of any considerable length in exactly the same way, the duplication would be laid to coincidence. So important is this contrast between the new and the old in spoken communication that it has been proposed to apply the name language to the relative static dictionary and grammar element, and to reserve the term speech for the adaptable, living drama of actual communication."

Pear (48) makes no such artificial demarcation between speech and language. In an article on *Speech as an Expression of Personality*, he notes that in England there is "an interesting taboo upon criticising, even mentioning a person's voice or speech"; the taboo does not apply to his writing, painting, music, sculpture, or sports. Nevertheless, he proceeds to analyze "public speaking." Its flaws, he discovers, are many:

"dropping the voice at the important parts of a sentence, saying nothing in many words, prefacing controversial matters by 'of course,' waiting for the inspiration of the moment (justifiable if and when it comes), reciting series of general statements without illustrating concrete examples, giving concrete examples without indicating the truth which they are meant to illustrate, not observing the effect of one's speech upon the audience, ignoring the type of audience to whom one wishes to appeal,

using the wrong pace—too fast, too slow, or in broadcasting, insufficiently varied, assuming one's audience to be at a fever heat of expectation when (or because) one begins to speak —."

From these and other analyses Pear concludes:

"The psychology of composing can only be hinted at here, yet the predominant mental imagery of a person who, with dictaphone, pen, or typewriter, is preparing the manuscript of a talk, will influence greatly his choice of matter and of manner."

The role of "mental imagery" is strikingly illustrated by the alliteration in Shakespeare's sonnets. This—as a study of literary behavior—has been made a topic of specific investigation by Skinner (58). Alliteration was a poetic device in great favor in Shakespeare's day. Shakespeare himself disliked it and sedulously avoided employing it in his plays. He used it freely in his sonnets—sonnets, it must be noted, are media for the voicing of, if not love, at least the finer and nobler sentiments.

Ford Maddox Ford, in a discussion of *Techniques*, notes that "such advocates of the study of technique as Conrad or Dowson or James or Crane or Flaubert are far more interested in the writer's finding himself than in establishing any one rule that shall cover every tribal lay," and writers, that is novelists, find themselves in their "appeal" to their "fellows" and thus, in writing, must have their eyes on the Reader. Conrad was immensely impressed—and depressed—by the idea of Flaubert's "impeccable unapproachableness"; he was "so divinely jealous" of the greatness of his fellow writers that he often despaired of being more than a mere pedestrian in the world of literature. But these were merely frustrations which he eventually surmounted by consciously developing a new form for the novel—by evolving, among others, "the convention of a Marlow who should narrate, in presentation, the whole story of a novel just as, without much sequence or pursued chronology, a story will come up into the mind of a narrator," and by laying down "as a law that, in introducing a character, we must always, after a few vivid words of personal description, apportion to him a speech that *must* be a characteristic generalization." Ford Maddox Ford, who struggled together with Conrad for over a decade, was immensely impressed, depressed, "divinely

jealous," despairing, in not wholly the same degree or in the same directions as Conrad. He surmounted his frustrations by, among other devices, dispensing with "a narrator" and evolving a technique for the presenting of conversation. "Eternal and universal" appeal, or popularity was Ford Maddox Ford's goal; Conrad's novels may have been only the address of an "I" to its "me" or only an address to his literary idols.

Here we have two novelists who consciously strove for certain effects, who even tell us how they were achieved. Yet we cannot say of either: The style is the man. True it is that we can distinguish a Turgenev, a Henry James, a Flaubert, a Conrad from one another, but not on the basis of structure alone. Content is inextricably bound up with structure. And if we wish to more than merely distinguish one man from another, to understand and know the man himself, we must inquire into his biography and his personal socio-cultural milieu or milieux.

Ford Maddox Ford tells us that Conrad consciously achieved the dramatic in this manner: "This fellow gets that effect by a cadenced paragraph of long, complicated sentences, interspersed with shorter statements, ending with a long, dying fall of words and the final taptaptap of a three monosyllabled phrase . . . just like that." Try to level this to a "mechanical carrier"! Yet Zipf (70) and Zipf and Whitehorn (71) do this obliquely: they plot logarithmic graphs of data yielded by "type-token ratio" analyses of James Joyce's *Ulysses* and a series of newspaper-writing specimens; against these they plot data yielded by similar analyses of the letters of patients; the deviations purportedly tell us something or other about the language of psychopathology. This scheme does an injustice to the respective skills of the investigators in linguistics and in psychopathology. It is an attempt to find a *norm* for style in "the successful charting of the course of speech between dull over-articulation and incomprehensible under-articulation."

The type-token ratio is the ratio of the number of different words (types) to the total number of words (tokens) in a given passage. Johnson (38) was among the first to employ it in the measure of *consistency* in the study of individual differences in linguistic expression. He recommends it as a more dynamic and

valid measure of vocabulary than simply ascertaining the number of words a person "knows" or can define. He suggests further that it will be found to correlate with intelligence, that it may be used to indicate the "stimulation value" of any situation, and that it may serve as a measure of degree of frustration or of disorientation,—thus the phenomena known as the "one-track mind" or "monomania" become amenable to quantitative treatment.

Zipf (70) himself implies that "types" are not too easy to identify when he writes: "The number of formal words in the vocabulary of any speech-group is by no means so large as the number of potential or actual categories into which experiential data may be or is divided."

A guide has not yet been written for Gertrude Stein. Two authors, however, have collaborated to produce one for James Joyce's *Finnegan's Wake*. It is a little over 300 pages and informs us, among other things, that a specified "neologism" has six different meanings dependent upon the context in which it appears and that the surname of a character in the book is prefaced by different initials dependent upon his role in varying contexts. Yet the type-token ratios of the samples utilized in the study by Zipf and Whitehorn are approximately the same.

The type-token ratio is but a variant of the sign-referend relation. That Zipf subscribes to this approach is implied when he says: "Neither the original meaning nor the etymological meaning of a word is necessarily its primary meaning: the meaning which has the most frequent usage is the primary meaning."

Zipf asserts that "the selection of samples of language may be dictated at least to a considerable extent by the investigator's convenience." Does he not mean: by the investigator's wish? Boder's (10) study of the adjective-verb quotient illustrates—though this was not his intent—that the sample is a significant factor. The Avq varies significantly with the subject matter of the text—it was lowest in the ten plays taken from Montrose J. Moses' "Representative American Dramas," highest in scientific writings—we hasten to add that these consisted of 30 specimens from Ph.D. theses, 14 from "Psychologies of 1925," 6 from scientific text books, 30 from Master's theses, and 3 from "The Nature of the World and of Man." The Avq varies also from writer to writer—Brisbane's,

for example, coincides with that of fiction, whereas Mencken's corresponds with that of scientific writings. The *Avq* in William James' letters is lower for those to men than for those to women at the age of about 40; the relationship is completely reversed in letters written after 65. Runion (52) also illustrates the importance of the sample—though this too was not his intent. He made a quantitative study of sentence length, sentence structure, sentence "artistry" and figures of speech in 50 speeches of Woodrow Wilson and found that employment of all these variables varied significantly with the occasion. Sanford (53), however, regrets that "these findings . . . in themselves tell little about Wilson's style," though they do "raise the interesting problem of situational determinants in linguistic behavior." Newman (44) and Balken (3)—though their studies are an intrusion in a context which accents the cognitive, prescriptive and normative—stress that the selection of samples of language may not be dictated "at least to a considerable extent by the investigator's convenience."

If the style is the man, the difficulty of identifying its "mechanical carriers" (a) are much greater in scope and depth for men who are not a Conrad, a Shakespeare, or a James Joyce. Fechner satirized quantitative science under a pseudonym; at the same time he carried on exact research in atomic theory, and was engaged in teaching the physics of his day. Which style was he? William James penned delightful letters to men and women; he also wrote *The Varieties of Religious Experience* and carried on teaching and lecturing. Which style was he? Stevens (60) argues that the initial data of description are equivalent with elementary reactions and the sign of a thing is therefore the same as the thing itself:—finger reactions are tonal intensities; scratches on a smoked drum are the feeding behavior of rats; stopping a car at a signal light is the color red; and so on. In language and personality, "the style is the man" is strikingly illustrative of the nonsense which *fondness* for a method can produce about a subject matter.

The cognitive, prescriptive, normative way of viewing speech and personality is fraught with some great dangers which can be avoided only through a comprehensive knowledge of the historic, ontologic—not phylogic development of men and of the circumstances under which

they acquire, adopt, discard, distort or modify language usages, and by abandoning the Rousseauian linguistic tradition—that the first men set themselves more or less deliberately to frame a language by an agreement among themselves for the purposes of communication and maintaining the *contrat social*. The frustrations arising from lack of "mechanical carriers" will then not be so insurmountable. As Cattell (12) notes:

"The proponents of measurement in this somewhat shadowy world of personality qualities stake their defense on the well known dictum of Thorndike that 'whatever exists, exists in some quantity, and can therefore ultimately be measured.' Unfortunately the optimism engendered in some psychometrists by this excellent statement blinds them to certain basic conditions of measurement, notably to the rule of elementary algebra that added units must be of the same kind. Therefore our first step must be to emphasize that measurement can only follow . . . upon advances in descriptive psychology."

It is difficult to grasp language except by its own metaphors. No attempt, therefore, will be made to describe it other than as a medium or media in which meet speaking, listening, hearing, thinking, conversing with oneself or others, answering, reading, seeing, writing, and so on. Herder was among the first in philology to formulate the beginnings of language in the child in the address of the "I" to the "me"; Freud among the first in psychology to formulate its beginnings in kinaesthesia, visual images and auditory images. Since then the fallacy of assuming a simple, specific derivation for language has been exposed by many investigators in psychology, psychopathology, sociology, and philology. Noteworthy in the context of language and personality are the contributions of Pear (*op. cit.*), Boder (*op. cit.*), Isakower (34), and Wallenberg (63).

Nor can language be defined in terms of the mechanisms for speaking, hearing, writing, and so on. Not only do all men possess the requisite mechanisms, but the mechanisms themselves are not wholly identified with language. They are employed coincidentally or independently for other functions—the mouth, for example, for eating; the vocal chords for coughing; the hands for bringing food or liquids to the mouth; and

so on. This fact is important for understanding the difficulties, resistances, and the many barriers and hindrances towards linguistic expression. It is as yet a relatively unexplored field in both psychology and anthropology. Sapir (54) urged psychologists, philologists, and socioculturalists to investigate it. The observations of psychoanalysts on this score, however, are suggestive almost to the point of bewilderment, whereas those of psychologists have been considered irrelevant for speech and personality and therefore overlooked—the eye-philologically minded psychologist might, at least, review the studies of gestures by Olson (46).

But men may be differentiated in terms of their instrumentation of language, in terms of their linguistic usages. Bergson laments: "Each one of us has his own way of loving and hating, and these loves and hates reflect the entire personality: yet language indicates these states of mind by the same words for everyone." The behaviorists, strangely, echo this lament in their deplorings over both the inadequacies and redundancies of language. But Bergson, it must be noted was speaking and writing of the French language. The attitudes of the French towards stylistic purity may be inferred from an anecdote (19) of Flaubert's violent reaction to young Henry James' joining the chorus of an almost unanimous contempt for the style of Merimee: "To think that an American should dare to have views as to the French of one of the greatest of France's stylists! Only to think it, was enough to make Villon, Ronsard, Racine, Corneille, Chateaubriand—not of course that their styles were anything to write home about—turn in their graves. . . ." Fenced in by such traditions regarding style, the French automatically resort to mimic and articulatory usages—all of which escaped Piaget's attention and interest in his studies of the language and social development of the child.

Gesture and articulatory instrumentation of language is an important feature of language. It would be desirable to include observations of individual differences in gesture and articulatory usages in our inquiry into the ways by which men may be differentiated in terms of their usages of language. Unfortunately, such usages have a long, complicated, genetic, social history and until the beginnings of speech in the individual have been more thoroughly explored we are compelled by scientific caution

to not include this instrumentation in studies of language and personality. It may be referred to as the shell of language; as such it is very important to the language of psychopathology—Klasi (39), for instance, was able to demonstrate that in 21 motor stereotypes not less than 9 were defensive acts against hallucinations of bodily sensations, whereas the others proved to be in part ceremonies, atonements, and so on. A plea for cinematic or dictographic or phonographic recordings may be answered by the comments of Cattrell (*op. cit.*) and the assertion by Zipf (*op. cit.*) that though the phonograph "records with a high degree of accuracy the gross acoustic effects of the stream of speech of an individual," it is "inadequate for dynamic philology as the final representation of speech." The advantages to pedagogy of such recordings is unquestioned; in research there always remains the problem of representative sampling and, most importantly, the personal equation of the investigator. Zeman (69), for example, spoke the German word "hein" into Scripture's speech recorder in three different ways, first as a quiet answer, then as a reassuring question, and lastly as a cross and impatient answer. How could he be sure that his vocalizations corresponded with his intentions, with only a recorder to question and to answer him!

The observation and description of "the very little difference between men" was pioneered in comparative philology by the Grimm brothers (early 19th century). Their primary interest, folk-lore, may have been impelled by a chauvinistic rebellion against Latin as the *sine qua non* of intellectual, social and political life. This in turn may have led them to disregard "the aristocratic narrow-mindedness with which philologists looked down on unwritten tradition, on popular ballads, legends, fairy tales, superstition, nursery rimes . . ." Very early in their endeavors to amass folk-lore, they found that they had to wander from community to community and thus to consider philology. They integrated ear-and-eye philology—"Speak that I may see and know thee." Language for the Grimm brothers was "an unconscious and unnoticed secret implanted in youth, never-resting, changing with time and place." They did not concern themselves with solving the secret, but devoted their attentions to the never-resting, changing with time and place aspects of language. Thus a language came to be viewed as

a repository of the wishes, frustrations, intentions and values of the men who spoke it—a key to their Weltanschauung, as it were. In this wise did the brothers Grimm “create a pattern for the scientific study of culture by comparative investigation of the entire mental life of which written literature is nothing but a small epitome.”

Freud's investigation of the language of the dream and the language used in reporting and associating to the dream led him inevitably into comparative philology. He found linguistic usage, mythology and folk-lore indispensable to understanding the structures and functions of dream-symbolism. Thus, Egyptian, “the oldest language known to us,” expresses two “most inimical thoughts” by “one and the same sound”; it also combines contradictory concepts into compound-words, “not in order to create a third concept, which happens now and then in Chinese, but only in order to express, by means of the combination of the two, the meaning of one of its contradictory members, which alone would have meant the same . . .”—in writing the intended meaning is indicated by explanatory pictures; in speech by gesture. These peculiarities of the Egyptian language, Freud found, appeared in the dream-work—“the word ‘No’ does not seem to exist for a dream. His philological source, in this instance, was a pamphlet by Karl Abel on the antithetical sense of primal words—a contribution to dynamic philology made possible by the pioneering of the Grimm brothers. In this wise, Freud also furthered the development of dynamic philology (3). These and many other observations, scattered throughout his extensive writings, too numerous and unfair to cite out of context, provide clues for identifying language usage variables in the study of personality. Those presented in *The Psychopathology of Everyday Life* must be familiar to everyone. Space does not permit review of the applications of his method of dream analysis to analysis of the language of personality (3).

Abraham, himself a competent philologist, was interested in comparative philology more in the spirit of a virtuoso than in the temper of research. His etymologizings, though entertaining and instructive in context, are not suggestive of clues.

Ferenczi, who seems to have been primarily interest in the perfecting of techniques for the

analysis of resistances, provides many clues. These are especially helpful in the study of speech and personality—contrary to popular belief in psychology, men cannot be made to tell what they can not or will not tell; therefore the investigator can use only what they do tell. If he dares do more and neglects evidences from other sources, however apt his virtuosity, he is allowing personal phantasy to interfere with scientific objectivity. As Zilboorg (72) and French (20) note, perhaps the most significant contribution of psychoanalysis to psychology and the social sciences is a technique for investigating human behavior, itself so highly charged with value judgments, despite the interference of the scientist's personal phantasies. Noteworthy in Ferenczi (17) are the chapters on “Abuses of Free Association,” “The Analysis of Comparisons,” and “Belief, Disbelief and Conviction.” The last named indicates the difficulties of attempting to reconstruct the personality of a scientist or a devotee or rejectee of an “ism” on the basis of merely the language usages of merely some published contributions: these were probably revised again and again before attaining final form and may or may not have pleased the author himself; frequency of footnotes and the fact of footnotes, quotations, bibliography, for example, do not have an invariable context and hence not an invariable significance. Pear's (*op. cit.*) contributions may be profitably re-examined in this context. When one reads or re-reads these articles, one is led to re-examine Sanford's hypotheses for the measurement of “egocentricism” and “dogmatism,” and then to dismiss them as sophistries extrapolated, admittedly, from Piaget by way of data from Markey and Le Brant.

French (20a), in *An Analysis of the Goal Concept Based Upon Study of Reactions to Frustration*, describes “the organization of behavior for wish-fulfilment.” This involves two steps. “The first is a *cognitive* one. One must understand one's situation so as to *know how to reach the goal*. The second step is *executive*. It is necessary to subordinate one's motor energies to just the kind of activity needed. . . . The two fundamental techniques for successfully dealing with an obstacle are (1) attacking and overcoming it or (2) yielding and modifying one's demands to correspond with what is really attainable.” Since language has an important space-time-pace economizing function

(4) in the organization of behavior for goal attainment, French's formulations provide an orientation in the study of speech and personality—for deriving generalizations which may serve as the basis of formulating problems and organizing data.

Significant also are the contributions of Cattell (12): "An attempt . . . to distinguish and classify the various forms of trait unity in which trait elements are found to be integrated," leads Cattell to say:

"Apparently there exist only three kinds of integration, which have been called *dynamic*, *environmental mould*, and *constitutional unities*. Logical, evaluative, stylistic, co-nascent, etymological, stimulus-response, and other unities, frequently utilized, by implication, in common speech (as indicated by a survey of trait names), have a self-consistency which is either one of the above basic forms, disguised, or which is spurious, nonfunctional, and resident only in the mind of the observer. Of the true functional unities it must be said, however, that since they are relations between a genetically mutable organism and an historically changing environment their permanence is only relative."

The "personality variables comprising the complete personality sphere" were condensed from Allport and Odbert's list of 17,953 terms applying to human behavior and from the psychological literature. Cattell argues the pros and cons of these verbal symbols as representative of the complete *surface* of personality and concludes that the hypothesis that language is "a complete, reticulated mirror to human nature" may be retained despite the "silences on the part of language," since "social experience has . . . performed its own factor analysis by linguistic methods."

These postulates may be extended to the linguistic usages of the individual in his organization of his behavior for wish-fulfillment and to psychoanalytic experience. We can hypothesize that the language usages of an individual are a complete, reticulated mirror to his personality and that psychoanalytic experience has performed its own factor analysis of the *whats*, *whys* and *wherefores* of human nature by linguistic methods. To this Cattell himself seemingly would have no opposition—elsewhere (12a) he maintains that psychoanalysis has attained a technical level in observation and description

yet to be attained by current psychological methods, and intimates that psychoanalysis attains this level precisely because, recognizing the semantics of intrapersonal obstructions to scientific thinking, it has been able to carefully describe and properly systematize a wealth of phenomena hitherto unobserved and therefore overlooked. Thus it utilizes even the silences of language. Ferenczi (*op. cit.*) comments on prolonged silences and sudden silences as manifestations of "association resistance" and on the reactions of the patient to the psychoanalyst's silence; Balken (3a) adapted the technique of the Thematic Apperception Test to delineate the meanings of the "silence" of schizophrenics; and Wallenberg (63) proceeds from the experiments of Fischer—these show the importance of identification with moving objects in our relationship to the outside world by means of visual perception—to delineate the relation of auditory perception to the perception of space and motion and the psychopathologies evolving from defective hearing.

Inspection of Cattell's 171 personality variables shows that only ten refer to abilities. The remaining 161 adjectival or adverbial-adjectival. Zilboorg (72), Scheikel (55), Carr, and Balken indicate, or rather suggest, that adjectival forms express affective judgments about persons and things—whether they affect one pleasantly or unpleasantly. (This may explain William James—at about the age of forty—employing significantly more adjectives in his letters to women than in those to men.) Psychoanalytic experience reveals that affective judgments are often evaluatively tinged; Cattell tried to eliminate such trait names—he could not, of course, eliminate all the contexts in which the selected trait names might be used. Psychoanalytic experience shows further affective judgments may be condensed in one linguistic form. Though Cattell seems to have successfully eliminated such condensations, the adverbial-adjectival trait names suggest interesting implications for further research. Connotative judgments, as Carr shows, indicate one's attitude to a person or thing, whereas affective judgments indicate how the person or thing affects oneself—one likes or dislikes, whereas the person or thing is pleasant or unpleasant. Connotative and affective judgments are not necessarily positively correlated—one may like what is unpleasant to oneself and dislike that which affects one pleasantly.

The reasons for this seeming paradox are to be found in the genetic, psychological history of the individual. Regardless of contradictions, connotative judgments linguistically express one's intentions; this is the underlying thesis of "likes and dislikes" vocational questionnaires—Ream (50), for example, differentiated two groups of salesmen, the one successful, the other unsuccessful, in terms of "likes, dislikes, indifference." In other words, connotative judgments indicate what one is apt to do in regard to something (*vide* French). It is not suggested that connotative judgments will be expressed invariably by the same linguistic usages, but merely that linguistic forms be analyzed in context and as to probable content and that Cattell's preliminary analyses and tentative findings are thus significant for speech and personality. It must be stressed anew that affective, connotative and evaluative judgments may be expressed in devious ways—Roback's (51) dictionary of international slurs or "ethnophaulisms" illustrates some of the ways—words (probably adjectival and adverbial nouns), phrases and proverbs.

Since psychoanalysis can dispense with neither contexts or content, nor condensations or judgments, its linguistic methods thus have the advantage, over those of recorded social experience, of seeing and hearing linguistic usages in action, as it were. Thus it has been able to evolve psychological laws, applicable over the whole range of mental life, including rational and irrational behavior, and hence invaluable to investigation into speech and personality.

It must be remembered that such investigation would not be possible without the earlier—and contemporary—work in the fields of perception, reaction time, intelligence, vocation and pedagogy. There is a tendency among psychologists to ignore contributions from these fields as irrelevant and even obstructive to the study of personality. Boring stresses that a sophistication which is not historical is no sophistication at all. The compulsion to neglect its own history accounts for the present predicament in inquiry into language and personality whose problems are confused with the language of psychology and the psychology of language.

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LANGUAGE, THE PSYCHOLOGY OF.

—The present article will restrict itself to those phenomena of speech of which there are quantitative studies that indicate the existence of general dynamic principles.

I. THE PROBLEM OF THE CLASSIFICATION OF SPEECH ENTITIES

The scientific study of speech may be said to have started millennia ago when, for the sake of devising a system of writing, man first began to concern himself with the classification of the stream of speech into its significant entities. The history of writing (cf. article on "Alphabet," *Encyclopedia Britannica*, 14th ed.), which is a part of the history of the psychology of language, reveals various more or less successful attempts in different regions to classify the local speech into its word elements, or its morphological elements, or its syllabic elements, or its phonetic elements, or even its morpho-semantic elements (e.g., Chinese). However, because the larger morphological, syllabic, and verbal elements of speech are intrinsically permutations of basic phonetic entities (e.g., *man* is a permutation of *m*, *a*, and *n*), the most practical classifications today are the alphabetic ones, of which the most extensive and accurate is the "narrow" *International Phonetic Alphabet* (of the International Phonetic Association). This alphabet classifies speech sounds essentially on an acoustic basis without concern about the particular phonetic differences in a given tongue that may be "significant" for that tongue in discriminating between its vocabulary of words.

As to the problem of determining "significant" phonetic differences within a given tongue, few solutions can compare with the simple method of *phonology* in the matter of operational neatness. This method consists of comparing pairs of words (i.e., *phonological*

oppositions) that are homophonous except for different phonetic entities, or *phonemes*, in analogous positions (e.g., *pin*, *pan*, *pun*, or *pin*, *sin*, *tin*). By studying the *phonological oppositions* of a given vocabulary of words, one can disclose the vocabulary's stock of different *phonemes* which may be appropriately defined as "the minimal phonetic units that are used in the vocabulary to discriminate between otherwise homophonous pairs of words." In many languages this *phonological technique* may leave a small residue of ambiguous items for which no *phonological oppositions* can be found. In the present writer's experience this residue is statistically negligible.

Although *phonologists* in recent years have added enormously to our descriptive knowledge of many different languages (a running bibliography of studies on the topic can be found in *American Speech*), and although the discovery of the phoneme has greatly simplified the transcription of speech, nevertheless some claims made by some phonologists would seem to be unwarranted if taken literally in a truly scientific sense. Thus despite claims to the contrary, it has never been shown that phonemes represent the minimal units of distinctive significance in any sense other than that of keeping phonological oppositions apart. Second, it has been shown by Eberhard and Kurt Zwirner ("Phonometrischer Beitrag zur Frage der neuhochdeutschen Quantität," *Archiv für vergleichende Phonetik*, I [1937], 96-113) that despite the assertions of some phonologists two different phonemes in a given speech are not always kept rigidly apart (e.g., the phoneme, short *ä*, in German which differs from long *ā* only in the matter of duration, is sometimes pronounced longer than is long *ā*; in point of fact the difference between the two phonemes is solely in their statistical modes).

II. THE GENETIC CLASSIFICATION OF SPEECH

Languages can also be classified on the basis of a common ancestry as ascertained by a comparison of forms and meanings. This work has long been conducted by *comparative philologists* (locally sometimes called *linguists*) who proceed on the basic assumption first empirically established by Karl Brugmann that *in a given language at a given time like phonetic entities under like conditions behave alike* (hereinafter referred to as *the orderliness of phonetic change*). For example, during a particular period

in Middle English all Old English words with a long \bar{a} became an open long \bar{o} which subsequently became the close long \bar{o} of today (e.g., Old English *stān*, *rāp*, *gāt* have become what we write today as *stone*, *rope*, *goat*). For most of the Indo-European languages, there are historical-comparative grammars and etymological dictionaries in abundance, of which perhaps the two best known are Karl Brugmann and B. Delbrück, *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen*, 5 vols., 2nd ed. (Strassburg, 1897-1911), and Alois Walde and Julius Pokorny, *Vergleichendes Wörterbuch der indogermanischen Sprachen*, 3 vols. (Leipzig, 1927-1932). This vast store of carefully collected and objectively analyzed material has confirmed the principle of the *orderliness of phonetic change* beyond any doubt.

This principle is of practical value to the social psychologist in helping to disclose the date of adoption of foreign loan-words. Thus the fact that we pronounce the vowels of the Romance loan-words *dame* and *fame* like the vowels of *make* means that the two words were adopted in Middle English times *before* a certain phonetic change had occurred (cf. H. C. Wyld, *A Short History of English*, 3rd ed., New York, 1927). The fact that an initial *d* in Latin, such as in *duo*, two, or *decem*, ten, appears quite generally in even present-day English as a *t*, such as in *two*, two, and *ten*, ten, suggests (simply stated) that the words are not loan-words but *cognates* that have been inherited from a common ancestry with differences ascribable to independent phonetic changes that were peculiar to the histories of the respective languages.

III. DYNAMIC PRINCIPLES OF SPEECH

From the earliest days of history down to the present, man has produced speech-theories of varying degree of gravity of utterance that have not always been free from a suggestion of

"magic," even in the case of many of the *ad hoc* speech theories of comparative philologists. In recent years, however, the problem of speech-dynamics has been approached with increasing scientific rigor.

A. *The Dynamics of a Phonetic System.* The French psychologist, R. Bourdon (in his *Des Emotions et des Tendances dans le Langage*, Paris, 1892), was apparently the first to observe that in many different languages the dental stops (e.g., *t* and *d*) are more frequent than either the labial stops (e.g., *p* and *b*) or the velar stops (e.g., *k* and *g*).

Subsequently G. K. Zipf argued (i) that the comparative difficulty of utterance of a phoneme in a given speech-community was inversely related to the relative frequency of its occurrence, and (ii) that the orderliness of phonetic change results from the tendency to preserve or to restore a dynamic equilibrium between the difficulty of utterance of phonemes and their relative frequency of occurrence. Although this second argument (ii) is too extensive to be included here (cf. G. K. Zipf, *The Psychobiology of Language*, Boston, 1935), nevertheless the nature of the data and theory of the first argument (i) can be indicated quite simply:

Thus if we take, for example, the twelve consonantal stops of Peipingese Chinese which consist of the six *more difficult* aspirated stops, *tʰ*, *pʰ*, *kʰ*, *cʰ*, *ʈʰ*, *tʂʰ*, and the six *less difficult* corresponding unaspirated stops, *t*, *p*, *k*, *c*, *ʈ*, *tʂ*, we find in samples of 37,338 running phonemes (Zipf, *op. cit.*) that each of the six *more difficult* aspirated stops is markedly less frequent than its corresponding *less difficult* stop, as is shown by the percentages of frequency of the whole of Table I:

Although the above data refer only to six pairs of phonemes in one dialect, nevertheless the statistical analysis of the frequencies of other types of phonemes in other languages reveals the same correlation. Thus, for example, the *more*

TABLE I
VOICELESS ASPIRATED FORTES AND VOICELESS UNASPIRATED LENES STOPS IN
PRESENT-DAY PEIPINGESE

(Percentages in reference to occurrences of all speech-sounds)

	<i>tʰ/t</i>	<i>pʰ/p</i>	<i>kʰ/k</i>	<i>cʰ/c</i>	<i>ʈʰ/ʈ</i>	<i>tʂʰ/tʂ</i>
Aspirated (<i>more difficult</i>)	2.56%	.56%	1.02%	1.04%	1.23%	1.40%
Unaspirated (<i>less difficult</i>)	6.18%	2.37%	2.58%	2.69%	2.44%	2.63%

difficult long vowels in a given speech are almost without exception much less frequent than their *less difficult* corresponding short vowels (if they are present in the language). So, too, the *more difficult* voiced stops,¹ *d, b, g*, are

practically always much less frequent than their *less difficult* corresponding voiceless stops, *t, p, k*, as becomes evident from the percentages of the whole in the following dozen languages of Table II:

TABLE II
PERCENTAGE OF OCCURRENCES OF VOICED-VOICELESS STOPS
(Diphthongs counted as one unit)

	t	d	p	b	k	g
Czechish	5.60%	3.73%	3.52%	1.86%	3.93%	.15%
Dutch	7.83%	4.67%	1.99%	1.20%	3.21%*	.09%*
English	7.13%	4.31%	2.04%	1.81%	2.71%	.74%
Hungarian	7.18%	3.30%	1.04%	1.71%	5.72%	2.45%
Lithuanian	5.76%	2.61%	3.71%	1.35%	4.61%	1.36%
North Russian	7.97%	1.52%	3.36%	1.01%	3.36%	.67%
South Russian	7.05%	2.46%	2.79%	1.51%	3.97%	1.66%
Wendish	6.26%	3.02%	2.55%	1.56%	3.29%	2.41%
East Ukrainian	3.83%	3.24%	2.82%	2.11%	4.11%	not present
Bulgarian	7.54%	3.55%	2.82%	1.32%	2.98%	1.46%
Greek	7.58%	2.87%	3.38%	.49%	4.07%	1.74%
Sanskrit	6.65%	2.85%	2.46%	.46%	1.99%	.82%

* Variphone.

Studies of this type, which have been carried on extensively, show that the entities of a phonetic system behave as a system in which dynamic equilibrium is preserved between frequency and difficulty of utterance. In this connection it should be pointed out that in a brilliant study of the errors made by deaf mutes in pronouncing different phonemes, C. V. Hudgins and F. C. Numbers ("An Investigation of the Intelligibility of the Speech of the Deaf," *Genetic Psychology Monographs*, XXV [1942], 289-392) have shown (363 f.) experimentally that the errors in articulating phonemes *increase* as the relative frequencies of the phonemes *decrease* (the correlation being .88, P.E. .02 for consonants, and .92, P.E. .01 for vowels)—thereby establishing a "pragmatic scale of difficulty" which is inversely related to frequency of occurrence.

Such few experimental and statistical studies in phonetics (cf. bibliography in *American*

Speech) as are cast in dynamic terms attest to the thoroughgoing orderliness of the phonetic process.

B. *The Generalized Law of Abbreviation.* The above inverse relationship between the comparative difficulty of articulation and the relative frequency of occurrence is not restricted to phonemes. On the contrary it is a conspicuous feature of all the entities of the speech-process.

Thus, when in a given language there are differences in the amount of stress-accent, whether between words in a sentence (e.g., *a mán*), or between the roots and affixes within words (e.g., under-*stánd*-ing), there is a marked tendency for the entities of comparatively lesser stress-accent to be coupled with a greater relative frequency of occurrence, although other factors are not absent (cf. Zipf, *Psycho-Biology*, op. cit., Chap. 4).

So, too, in respect of the comparative lengths of words (*ibid.*, Chap. 2), or of their morphological parts (*ibid.*, Chap. 4), there is an unmistakable inverse relationship between length and frequency of usage which according to the research of E. L. Thorndike ("Studies in the Psychology of Language," *Arch. of Psych.*, No. 231, Sept., 1938, 67) applies even to

¹ For experimental support of this statement of greater difficulty, cf. C. V. Hudgins and R. H. Stetson, "Voicing of Consonants by Depression of Larynx," *Archives Néerlandaises de Phonétique Expérimentale*, XI (1935), 1-28. For the statistics on these voiced and voiceless stops, cf. Zipf and Rogers, *ibid.*, XV (1939), 111-147, also Zipf, *Psycho-Biology*, op. cit.

whose frequencies are less than two in a million. As to the mechanisms whereby this inverse relationship is preserved, Zipf has argued (*Psycho-Biology, op. cit.*) that truncations of form (e.g., *gas* for *gasoline*, or *phone* for *telephone*) and substitutions of short words for long ones (e.g., *car* for *automobile*, or *current* for *electricity*) play an important role.

Whether the above inverse relationship between length and frequency (the Law of Abbreviation) applies also to the lengths and frequencies of phrases, clauses, sentences, and so on, has never been empirically tested. Nevertheless, A. C. Norwine and O. J. Murphy ("Characteristic Time Intervals in Telephonic Conversation," *Bell Telephone System Technical Publications, Monograph B-1074*, also in *The Bell System Technical Journal*, XVII [1938], 281-291) have shown that in telephone conversations the short "utterances" or "talk-spurts" are much more abundant than the longer ones with frequency rapidly decreasing as the size of the utterance increases. Eliot D. Chapple has confirmed this finding in his studies of non-telephonic conversations, and has further found, as we shall presently see, that there is a logarithmic linear relationship between the lengths and frequencies of a person's utterances and silences during his conversations ("Personality Differences as Described by Invariant Properties of Individuals in Interaction," *Proc. National Academy of Sciences*, XXVI [1940], 10-16).

C. *The Effect of Analogy.* Of particular interest to students of human behavior is the phenomenon of analogic action where a particular act of one class, say *a*, which has certain characteristics of another class, say *b*, alters its behavior so as to conform completely to the criteria of class *b*. The phenomenon of analogy is both frequent and transparent in speech. Thus, though we are taught in school that the plural of *ox* is made by adding *-en* to *oxen* (class *a*), whereas the plural of most other nouns is made by adding *(e)s*, as in the case of *boxes, foxes, cats, dogs, houses* (class *b*), nevertheless we frequently hear the plural *oxes*, apparently out of respect for what is the plural-pattern in the overwhelming majority of nouns. Expressed as a ratio, we may say that *ox:oxes::box:boxes*. The same argument applies to the past tense of *to dive*, which today is *dived* (out of respect for the prevailing pattern) instead of the older *dove*. There are also cases of analogic changes

in accentual and phonetic structure' (Zipf, *Psycho-Biology, op. cit.*, Chaps. 3 and 4); and so too in the syntax of phrases (e.g., the more traditional *different from* becomes *different than*, presumably in analogy with *other than*).

In the analogic changes of speech we see perhaps the economy of reducing the number of different classes, or "stereotypes," in terms of which speech-action occurs.

D. *The Frequency-Distribution of Words.* In studying stenographic problems, J. B. Estoup (*Gammes Sténographiques*, 4th ed., Paris, 1916) observed the general hyperbolic relationship between the number of new and different words in successive samples of a thousand French running words on the one hand, and the cumulative diversity of vocabulary on the other. Since then innumerable frequency studies have been made.

In 1928, E. V. Condon ("Statistics of Vocabulary," *Science*, LXVII [1928], 300) presented graphically the frequency-distribution of the *n* different words in a large sample of speech, ranked in the order of decreasing frequency. In this he found that the *r*-rank of a word, when multiplied by its *f*-frequency of occurrence, approximated the equation² $r \times f = C$. In Figure I we find two examples of this distribution, with *r* measured logarithmically on the abscissa and *f* logarithmically on the ordinate for (I) the vocabulary of James Joyce's *Ulysses* (M. L. Hanley, *Word Index to James Joyce's Ulysses*, Madison, Wis., 1937), and (II) the 43,989 running words of samples of American newspapers according to R. C. Eldridge (*Six Thousand Common English Words*, Buffalo, 1911).

However, if we consider the curves of Figure I as particular cases where $p = 1$ of the generalized harmonic series:

$$F.Sn = \frac{F}{1^p} + \frac{F}{2^p} + \frac{F}{3^p} + \dots + \frac{F}{n^p}$$

in which the denominators refer to the respective ranks of the *n* different words in the sample (and where $F = n^p$), we have a more useful equation in mathematically describing a "saturated" sample of approximately $F.Sn$ running words. Thus, in the polysynthetic American In-

² Zipf's subsequent and independent observation that the *N*-number of different words of like *f*-frequency under certain conditions approximates the equation $N \times f^p = C$ is corollary to the above (cf. *Psych. Record*, II [1938], 347-367).

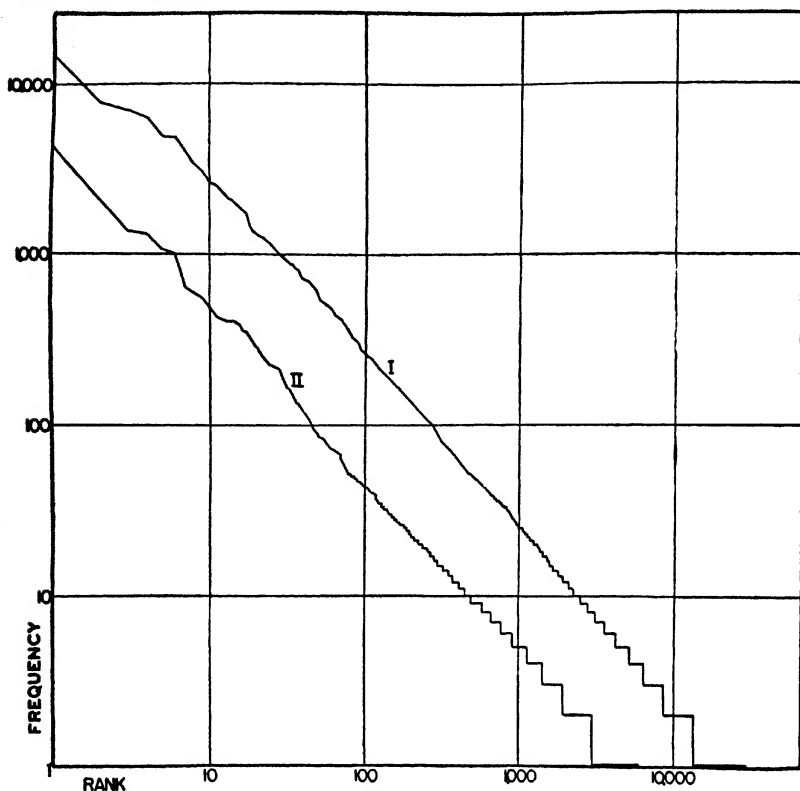


FIGURE I

dian languages of *Nootka*, etc., Zipf has observed values of p that are less than 1.³ J. C. Whitehorn and Zipf ("Schizophrenic Language," *Arch. Neur. and Psychiatry*, XLIX [1943], 831-851) have observed a value of p greater than 1 in the letters of a female paranoid schizophrenic—a finding that was subsequently confirmed independently by Dr. James J. Miller in his hitherto unpublished study of the conversation of a schizophrenic patient. Nor is this observation inconsistent with S. W. Cook's and B. F. Skinner's study of certain verbal association data of the insane ("Some Factors Influencing the Distribution of Associated Words," *Psych. Record*, III [1939], 178-184).

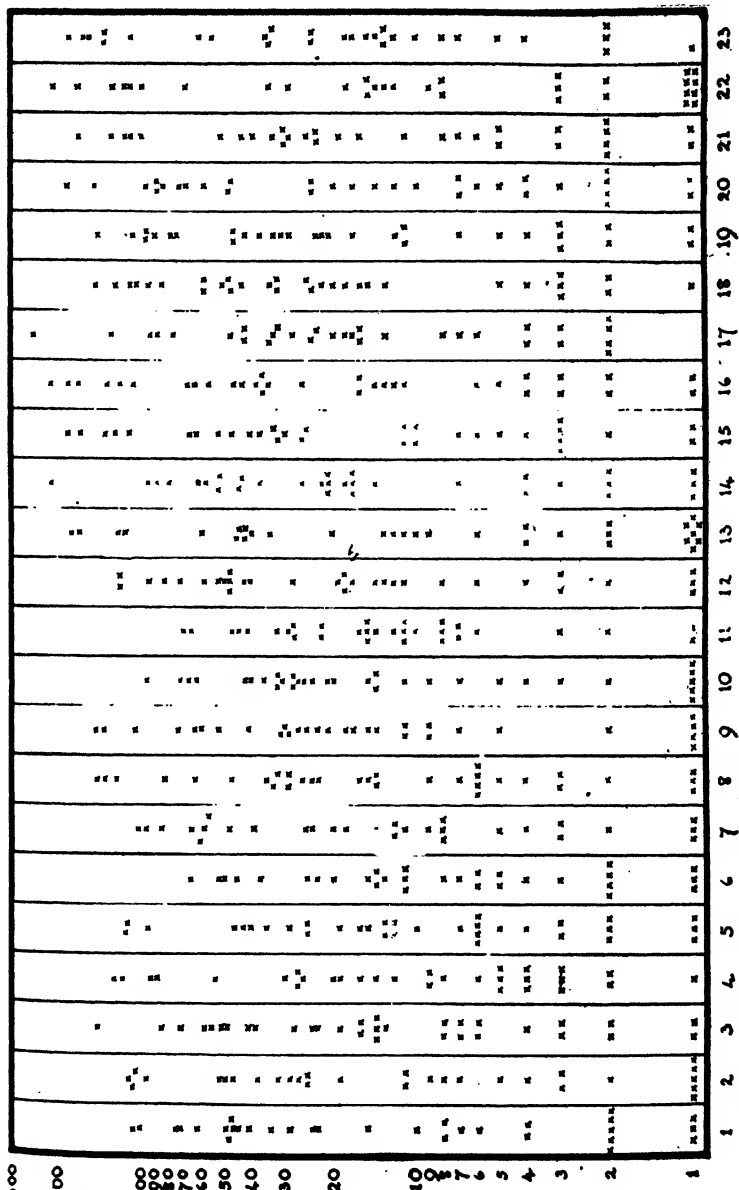
As to the size of n (and Sn) in the above

³To be reported in his forthcoming book, *The Principle of Least Effort*.

equation Zipf has noted in his studies of children's speech (preliminary report, *Science*, XCVI [1942], 344-345; complete report to appear in *The Principle of Least Effort*) that there is a positive correlation between n (and Sn) and the chronological age of the child, as is to be expected.

But although the above equation of the generalized harmonic series may be of great descriptive value, it can scarcely be the primary equation since it tells us nothing about the length of the intervals, I , between the repetition of words, a problem whose preliminary exploration was kindly undertaken by my former seminar student, Dr. Alexander Murray Fowler, and later extended and published with detailed theoretical and mathematical treatment (G. K. Zipf, "The Repetition of Words, Time-Perspective,

Interval
Size 300
(in
Pages)



Order of Interval in Time

FIGURE II

and Semantic Balance," *Jour. General Psych.*, XXXII [1945], 127-148, with 28-item bibliography). According to the data of the Hanley word-index to Joyce's *Ulysses* (*op. cit.*), the N number of different I_f intervals of like length (in pages) between the $f-1$ repetitions of all words in the *Ulysses* of like f -frequency approximates the simple equation:

$$N \cdot I_f = a \text{ constant.}$$

As a typical example of this distribution we find in Figure II the actual data for the I_{24} intervals between the repetitions of all the 34 different words occurring 24 times in the *Ulysses*; arithmetically on the abscissa are noted the 23 (i.e., $f-1$) successive intervals, and logarithmically on the ordinate are indicated with crosses the I interval-sizes in pages for the 782 (i.e., 34×23) different intervals between repetitions. An inspection of this scatter-diagram reveals not only that the I -intervals of varying lengths are distributed quite evenly over the entire book, but also, and even more significantly, that they are similarly distributed in each of the successive intervals. Zipf has argued (*ibid.*) that this indicates the even distribution of minimalized work over time, and that the foregoing equation is primary to the others which are corollary to it.

E. *The Problem of Distributing the "Meanings" of Words.* Inasmuch as words are used to convey "meanings" (i.e., to evoke more or less stereotyped responses in the interlocutor) the question presents itself as to what these clear-cut linear word-frequency distributions may indicate about the distribution of different "meanings" among the words. Although the theoretical problem is too extensive to discuss here,⁴ Zipf deduced theoretically that the m_f number of different "meanings" of a word of f -frequency would tend to approximate the square root of f , or:

$$m_f = f^{\frac{1}{2}}$$

For the purpose of testing this theoretical equation Zipf, with the help of his students, ascertained from the data of the *Thorndike-Century Senior Dictionary* the average m -number of different living meanings per word (according to the Lorge-Thorndike semantic count, cf. *ibid.* preface) for the twenty successive sets of thousand most frequent words of the E. L. Thorndike list of 20,000 most frequent English words (E. L. Thorndike, *A Teachers Word*

⁴ Cf. G. K. Zipf, "The Meaning-Frequency Relationship of Words," *Jour. Gen. Psych.*, XXXIII (1945), 251-256. To be treated more fully in *The Principle of Least Effort*.

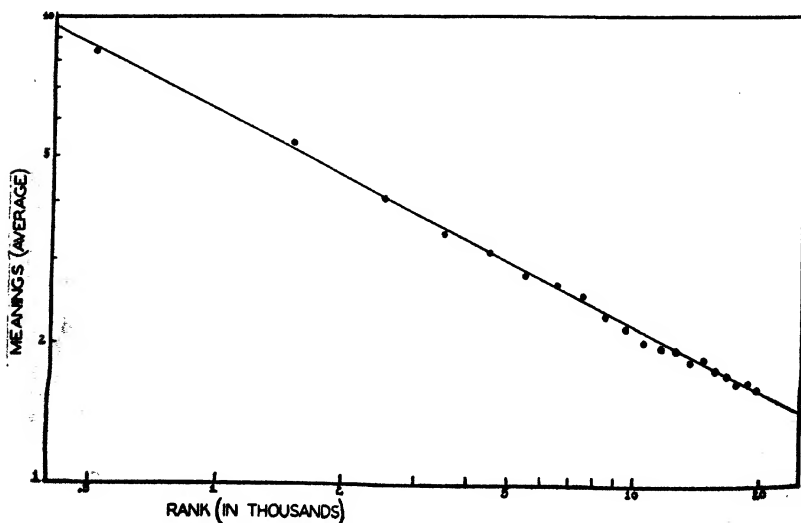


FIGURE III

Book of the Twenty Thousand Words, etc., revised, New York, 1932).

The results of this investigation are presented graphically in Figure III, with the ranked thousands of words measured logarithmically on the abscissa, and with the average meanings per word measured logarithmically on the ordinate. By least squares these points of Figure III have a negative slope of .4605 ($\pm .0083$). And if we may assume that the rank-frequency distribution of the underlying words would approximate the equation of the generalized harmonic series with $p = 1$, then we may say that these data can be approximately described as

$$m_f = f^{-.4605}$$

In any event the linearity of the data of Figure III, which far surpasses even the fondest hopes of the present writer, shows that there is indeed a law of word-meaning distribution.

F. *Summary of General Speech-Dynamics*. Although the foregoing data represent only a small sample of the present-day resources of statistical findings, nevertheless they suffice to show that the speech-process is dynamically structured according to fundamental principles that apparently operate quite generally with extreme rigor. And that seems to be the case whether we view the sizes and frequencies of usage of words, or their rate of repetition, or their respective "loadings" with "meanings," or the phonetic minutiae of which they consist. Since it is difficult to imagine that the speech-process is not completely integrated with the rest of the personality and with human social relations, these findings would seem to impose important restrictions upon all theories of the personality and of human relations.

IV. STYLE AND PERSONALITY INVARIANTS

Each person's speech is to some extent characteristic of him, whether because of its tone, timbre, and the like, or because of his choice and arrangement of words and the speed with which he talks, or because of his general loquacity or taciturnity—or because of a combination of all these. And to some extent a person's written style may be characteristic of him. Indeed, since earliest times, holy men have scrupulously guarded the precise structure of sacred texts, while the reconstruction of the original texts of past authors has provided a livelihood for innumerable philologists who

have also not hesitated to ascribe texts to one author or another on the basis of generally subjective criteria of style (though sometimes they may naively strive to be objective). Perhaps the most articulated of these subjective (or quasi-objective) tests of style is that of E. Sievers (*Ziele und Wege der Schallanalyse*, Heidelberg, 1924), which, though no longer in vogue today, is nevertheless typical of the "Pentecostal" (or "Whitsuntide") methods of analysis that are employed in such problems by European and American experts in the humanities today.

In the meantime, however, with the general advance of scientific interest, clear thinkers, unencumbered by the "Pentecostal" traditions of linguistics and the humanities, have turned with considerable success to the problem of the characteristics of individual speech style.

Thus, in 1938, G. Udny Yule published ("On Sentence-Length as a Statistical Characteristic of Style in Prose; with Application to Two Cases of Disputed Authorship," *Biometrika*, XXX [1939], 363-390) his quantitative investigation of sentence-length as a statistical characteristic of style in prose. Dividing sentence-lengths into classes of 1-5 words, 6-10, 11-15, and so on, Yule analyzed two sizable samples each from Bacon's *Essays*, Coleridge's *Biographica Literaria*, Macaulay's *Essays*, and Lamb's *Elia* and *Last Essays of Elia*. In each case he observed that the two samples from the same author agreed fairly closely, while differing from those of other authors. He then applied his technique to writings of disputed authorship.

In 1944, Yule reported (*Statistical Study of Literary Vocabulary*, Cambridge, England, 1944) the results of his statistical analysis of the diversity and frequency of nouns in several authors. Despite the admitted incompleteness of Yule's work, which may have resulted to some extent from Yule's strange unawareness (p. 32) that anyone else had compiled and studied word distributions,⁵ the analysis itself is of great didactic value both for its statement of statistical problems related to the topic and for its application of statistical methods to some of those problems.

A study of alliteration and of certain types

⁵ For a fairly complete bibliography of the now enormous literature on word-frequency distributions, cf. C. C. Fries and A. A. Travers, *English Word Lists*, American Council of Education, Washington, D. C., 1940.

of sound-patterning in poetry by B. F. Skinner ("A Quantitative Estimate of Certain Types of Sound-Patterning in Poetry," *Amer. Jour. of Psych.*, LIV [1941], 64-79) has also yielded interesting results—though partly of the nature of a negative proof—and is of considerable value in helping to state objectively the entire problem of literary and stylistic criticism. Moreover, B. F. Skinner's invention of the verbal summator ("The Verbal Summator and a Method for the Study of Latent Speech," *Jour. of Psych.*, II [1936], 71-107), together with W. K. Estes' invention of the visual form of the summator ("A Visual Form of the Verbal Summator," *Psych. Record*, IV [1940], 174-180), offer distinct possibilities of studying quantitatively a person's own verbal associations, which, more than anything else, would seem to be peculiar to his personality.

As far as the diversity of a person's vocabulary is concerned—a topic inferentially broached by Estoup (*op. cit.*) and latterly treated in respect of nouns by G. U. Yule in his recent book (*op. cit.*)—J. B. Carroll, who has studied the problem both quantitatively and theoretically with great care, believes: "An index of diversity might also be used to differentiate linguistic materials with respect to stylistic and other characteristics." (J. B. Carroll, "Diversity of Vocabulary and the Harmonic Series Law of Word-Frequency Distribution," *Psych. Record*, II [1938], 379-386.) Carroll's equation for vocabulary diversity would seem to be of considerable practical value (if, as he points out, the equation of the harmonic series is known to apply to the entire sample).

Addressing himself to the topic of speech and the personality, F. H. Sanford restricted his investigation to a comparative study of the speech-action of two young men, and is able to report on the basis of extensive and scrupulously detailed data (F. H. Sanford, "Speech and the Personality: A Comparative Case Study," *Character and Personality*, X [1942], 169-198): "By means of 234 'mechanical,' grammatical, 'psychogrammatical,' and lexical categories, samples of oral speech from two subjects were subjected to an intensive statistical analysis. The quantitative data yielded by this analysis lend themselves to conceptualization in terms of linguistic traits, one group of traits for one subject, another group for the other."

At about the same time the above studies were undertaken, Eliot D. Chapple, likewise working independently, studied the ratio of an individual's speech-actions to his speech-silences in conversations. Chapple discovered (*op. cit.*, p. 15): "The measurement of the interaction of individuals provides us with an opportunity to find out whether any unique property of an individual, ordinarily called 'personality,' manifests itself when two people are talking together. When a series of observations is made, the frequency distributions of the durations of actions and silences are fitted to the exponential equation, $F = ae^{-bt} + ce^{-dt}$, and the plot of $\log b_a/b_s = -\log d_a/d_s$ with a slope of 1." (I.e., of -1, *ed. note.*) "The position of this curve as defined by the intercepts is invariant for each individual, since it does not shift when the individual interacts with different individuals. The range of the curve also may be invariant for each individual, being delimited at the lower end by the absence of a d silence slope and at the upper end by the absence of a d action curve. These invariant properties afford us a quantitative description of individual differences in 'personality' as exhibited in the rates of acting and being silent in interaction."

Although in the present writer's opinion the above Chapple observation is of enormous theoretical value in understanding the economy of mentation, it should be pointed out that Dr. Chapple has also found his methods of great practical value in the entire field of the diagnosis of personality disorders (cf. E. D. Chapple and Erich Lindemann, "Clinical Implications of Measurements of Interaction Rates in Psychiatric Interviews," *Applied Anthropology*, I [1942], No. 2, 1-11).

In addition to the foregoing studies there are many others for specialized fields, such as that of Mary Shattuck Fisher for children's speech ("Language Patterns of Preschool Children," *Child Development Monograph*, No. 15, Teachers College, New York, 1934). The problems of reading and spelling are quite properly fields in the general psychology of language. These will be found abstracted in the *Psychological Abstracts*. For the entire field up to 1936, including also the largely subjective treatises, there is an excellent critical bibliography by Donald V. McGranahan ("The Psychology of Language," *Psych. Bulletin*, XXXIII [1936], 178-216). For

additional bibliography and discussion see J. Eisonson, *The Psychology of Speech*, New York, 1938.

V. GEOGRAPHICAL AND SOCIO-ECONOMIC ASPECTS OF SPEECH

In addition to the internal dynamics of speech and their peculiar manifestations in the speech of different persons, there are also geographical and socio-economic factors in speech that may be of considerable importance to social psychology.

A. *Dialect Geography*. A native of New Orleans in talking to a native of Chicago, Boston, or New York will unwittingly inform the latter of his place of origin, because of his peculiar "accent." This relationship between a person's accent and his regional origin has long been noted and during the past century has evoked the ever-growing interest of specialists in the field of dialect geography (for an excellent account see L. Bloomfield, *Language*, New York, 1933, Chap. 19; for a fairly complete annual bibliography of articles consult *Indogermanisches Jahrbuch*, Strassburg-Berlin, annually since 1914). The chief weakness of dialect geography to date, as far as dynamic social structure is concerned, is its tendency—unlike present-day geography—to ignore the research in the growing field of demography (for a bibliography of demography see the quarterly *Population Index* of the Population Association of America).

B. *Speech as Socio-economic Cues*. It has perhaps always been known that a person's speech tends to reveal a person's social-economic class-origin (cf. G. B. Shaw's *Pygmalion*). In this sense a person's speech may be viewed as consisting in part of what can appropriately be termed *socio-economic cues*. This problem has been approached with the broadest possible perspective in the penetrating study of trait-names by G. W. Allport and H. S. Odbert ("Trait-names," *Psych. Monographs*, No. 211, 1936), whose discussion (pp. 1-37) of the entire problem of the verbal labelling of the "other fellow's" traits of disposition may be viewed as a classic introduction to the field. But as to the narrower topic of correlating particular traits as cues to membership in particular socio-economic groups, investigation still lags.

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LEARNING.—The problem of learning is one of the most important in the whole field of psychology, because all human behavior, on whatever level and under whatever circumstances, involves learning of one kind or another. It is clear from this statement that we are making the meaning of the term *learning* more or less equivalent to the meaning of such words as change, modification, growth, development and adjustment. To be sure, these words have, in addition to their general meaning, specific implications, but any organism, at any stage of its evolution, is not only in an environment but is being acted upon by that environment and reacting in turn to it. And all such action-reaction behavior involves changes and modifications of the organism as well as, in some instances, changes in the environment.

These statements hold true regardless of what position we take as regards endowment or heredity. Whether we conceive of the organism from the moment of birth or from the moment of conception, the general statements of the first paragraph hold true. We shall not, in this article, be concerned with the problem of heredity, but rather, as is clear from the title, with the general problem of learning. It is also evident that change, modification, or learning take place in the action and reaction of the organism and the environment, whether such change is intentional, deliberate, and controlled, or haphazard, uncontrolled, and without intent. Some writers are wont to use the term *learning* only in deliberately controlled situations, but the modifications and changes that take place without intent are often even more productive of major shifts in the organism, in its relation to the environment, than the specifically deliberate modifications.

The same general principles are involved when a student sits down to learn how to extract cube root or when that same student inadvertently and unwittingly acquires at some period in his life a fear of cats or of the dark. Furthermore, the same principles of learning are involved when a cat learns to get out of a box, a rat to run a maze, a child to tie or untie his shoe-laces, or an adult to give a public speech. In short, learning may involve modifications of a motor nature, a verbal nature, an emotional nature, or as is most frequently the

case, a combination of these aspects of behavior.

We may look at the whole problem from still another general point of view before going more into detail. As we look at the organism it is clear that the very term organism implies an environment; neither one can exist without the other. The organism, for its part, is equipped through its early growth *in utero* with two sets of so-called receptors. First, the external receptors such as the eye, the ear, and the skin which are literally energy-catching devices directly in contact with the environment where energy of various sorts is constantly being given off. These receptors react to this energy, pass it on through the connector system whence, in turn, it passes on to muscles that then move the organism in the environment, modify the environment, result in a speech reaction, or some combination of these. The channels through which this energy passes from the environment through the organism and thence back to the environment are not pre-established by any specific endowment or hereditary influences. On the contrary, as we know, early energy-impacts on the organism tend to flow out widely and indiscriminately resulting in diffuse rather than particularly adjustive behavior. Nonetheless, such non-adaptive channels as are thus used become the basis for the later refinements and specificity of exact adjustment.

It is true, secondly, that there are interior receptors which are acted upon by the physical and biochemical energies of the organism, which energies like those originating externally, find their way out through channels that ultimately involve either movements of the organism in the environment, modifications of the environment, or modifications of the set and condition of the organism itself, interiorly. It is also true that some energy-impingements from the external environment result in interior modifications of the organism itself. This is, of course, the field of psycho-somatic changes so that we can say, for example, that we learn to have a tachycardia or to so modify the internal coats of the stomach that an x-ray will reveal that we have literally learned to have ulcers.

This particular article goes on the assumption that learning is then a modification due to the energies of the organism and the environment impinging on the organism itself. To be more explicit, every stimulus, that is, every

sufficient item of energy impinging on the organism from within or without, must lead to some behavior-reaction, internal or external. If the energy is sufficient to trip off a receptor, that energy cannot be stored or rejected, but must find exit in some effector-apparatus, either internal or external or both. Not only can energy not be stored or inhibited in its transit through the body, but it is also evident that there are no immutable or predestined requirements as to what the behavior-response or final energy manifestation will be. In short, any stimulus, internal or external, depending on the previous experiences and the present condition of the organism, can result in any response. And it is just these energy intakes and outputs which bring about those more or less permanent changes in the organism and particularly in the connector system which constitute learning.

Learning, in short, is the making of connections or circuits between receptors and effectors. All learning is, therefore, subject to further modification and learning, so that one can say not only that an old dog can learn new tricks, but that no previously established circuit or behavior-response is immune to further modification. It is probably true that, once a circuit is established, in some sense it remains integral, apart at least from ravages of disease or physical damage. But this does not mean that adjuncts and modifications cannot be joined to any given pattern of learning, or that a so-to-speak parallel form of response cannot be also established.

The relatively simple statements of the above paragraphs should not be taken too simply or too narrowly. As a matter of fact, which common observation sustains, seldom if ever do we respond to one simple energy in-put or stimulus with one simple energy output or response. As the organism gets older and older it responds more and more to a cluster of stimuli or a complex situation with a cluster of responses or an adjustive act. But it is always possible, in moments of extreme danger or in situations of unexpected violence, to revert to earlier and simpler stimulus-response reactions. This means that the relation of the organism and environment, taking into account both internal and external receptors, and internal and external effectors, is an extraordinarily fluid and complex sort of thing, which can be viewed now statically and academically in cross-section, but

which is in reality a fluid, growing, changing, integrating affair.

In all the above, certain dynamic principles are, of course, implicit. With reference to our statement of the organism-environment relationship, it must be further said that while there is a fluid and dynamic there is also, nonetheless, a deterministic relationship. An organism from the point of view of learning or of expressing previous learning, is in no sense able to act without a stimulus, internal or external, and it can only act in terms of all the factors involved. The organism, in short, is an energy-gathering, energy-sorting, and energy-delivering mechanism, if by mechanism we do not mean something set and fixed in make-up and capacities. The young organism, prior to or just subsequent to birth, is much more subject to the crude push and pull of the environment than is an older organism which has acquired specific patterns of response due to the effects of living in previous environments. But this dependability upon the environment for stimulus and growth is merely one side of the problem. There is also the growth and modification of the organism itself which, though they are a function of previous experiences, come to have a more and more cumulative and decisive effect in total behavior. We can never escape the environment, but if our previous learning has been adequate, we shall be able to respond with greater and greater adequacy from the point of view of the welfare of the organism.

The organism, therefore, registers within itself previous environments in the form of neural patterns of response and, like the chambered nautilus, can build itself, within the limits of any given environment, more and more facile and more and more intricate adjustive patterns, until the day comes when the organism, as such, begins to decline, loses its flexibility and learning capacity, and becomes once more subject in greater degree to the push and pull of the environment. The organism is born very ineffectual, requiring much care and guardianship, learns much directly and indirectly, adjusts itself more and more cogently, takes into account more and more of the colorings and shades and details of the environment, until it loses its capacity for further learning due to decay of tissue. Much of this learning and modification, as we have already pointed out, is unforeseen, unintended, and just happens.

Some of it is deliberate and intended, either under the directorship of teachers or parents, or of purposes and plans which have previously been instilled. The organism, therefore, is constantly in a delicate state of balance, striving on the one hand to obtain what it needs and finds pleasure in and, on the other hand, striving to avoid what interferes with its needs, upsets its balance, and gives it pain and dissatisfaction.

In terms of the general statements of the above several paragraphs we must re-emphasize and distinguish several different aspects of a stimulus situation. First of all, there are internal stimuli originating in tissue conditions which lead to overt and observable behavior. But it is also true that in a wider sense, external conditions of temperature and the like, so affect the body that these internal tissue conditions are literally touched off by the environment. Secondly, of course, external conditions can bring about external responses. Some of these responses are directed primarily toward altering the environment, and still other responses are directed toward modifying the condition of the organism itself through manipulation of the environment. The tissue conditions themselves we have called "drives," and the behavior which modifies the tissue conditions and satisfies them through use of the environment we call "mechanisms." It is also clear that, through conditioning and learning, the whole situation becomes extraordinarily complex, so that mechanisms which have been previously associated with the satisfying of a given drive, may themselves become satisfying in their functioning apart from the actual operation of a drive. Thus play and exercise are, so to speak, self-sufficient and self-supporting mechanisms which originated as simpler exploration and manipulation of the environment, thus serving as a mechanism directly in terms of a drive. Any habit is, in some sense, a mechanism, but it may achieve an independence and become satisfying in itself apart from its specific origin. In short, all behavior is a function of the condition of the organism in relation to that of the environment, with a constant shift of emphasis to the inner and outer conditions.

We have already mentioned internal receptors which are stimulated by the condition of the surrounding tissues in which they lie. They constitute, as we have said, so-called drives. Take, for example, hunger in a young child or

other animal, such as a dog. Shortly subsequent to birth, since the organism is in an environment of lower temperature than the body itself, and since random movements caused by internal or external stimuli will use up energy and blood sugar, tissue changes of a very complex nature take place. Unless these tissue changes are in some sense restored to normal, the organism will perish. But the young organism has no conception or understanding of this total and complicated state of affairs. The tissue changes in question simply stimulate and energize the receptors that are adjacent, and the receptors, in turn, pass on the energy to the connector system and thence by diffusion to effectors external or internal. This, in a very young animal, results in whines, cries, writhings, as part of the total diffused reaction. An older animal, through previous experience, recognizes these responses to an internal state of affairs, and attends to the young organism. Thus certain cries and actions are at one and the same time a signal to the older animal, and a so-called mechanism in the process of being formed or learned on the part of the younger organism. By and by, through various further stimulus-response achievements, ever greater specificity of learning occurs on the part of the young organism, and the child will say "food" when hungry. This is learning, i.e., forming a specific response pattern to a stimulus.

Consider as a similar but more complex example a somewhat older dog or child when it becomes hungry. Let us assume here that motor co-ordination has proceeded much further, that the animal is able to wander around but is yet without much understanding or comprehension. It is still responding in large measure to the released energy of its internal receptors, and it would not be accurate, at this early state of affairs, to say that the animal is deliberately and actually seeking food. On the contrary, it is acting still more or less at random, in terms of internal drives and tissue conditions. If, in the course of such semi-random motor movements, it finds food under a cluster of circumstances of sight, sound, and odor, it may again under similar internal conditions wander in the same direction and find the same satisfaction.

Learning is here definitely progressive. But, be it noted, that however simple or however complex the behavior involved, it is in response in the instances given, to a stimulus arising

from a state of the organism. Mechanisms or methods of satisfying such an internal state of affairs may become very complex and involve all sorts of fortuitous and irrelevant conditions of satisfaction. From this point of view we may say, still having in mind internal organic states, that however complex and sophisticated behavior seems, it involves at least in part just such simple drives or tissue conditions, though the external complications of the observed act may at first sight hide their basis.

The above stresses the organic aspect of learning, but we have also pointed out that the organism always lives in and learns in terms of the factors of the environment. Therefore, external stimuli also play a part in learning. The environment may very much restrict a given drive, exaggerate or distort it, so that one child may exhibit many food and feeding difficulties and even become definitely ill because of them, while another will, for reasons that are discernible upon analysis but often lost to the observation of everyday living, become very eccentric and refuse to eat any but a very limited and insufficient number of foods. And yet each such problem is due to a tremendously complex organization of organic and environmental stimuli and situations. In short, we have here an instance again of our former statement that any stimulus can be joined to any response, whether the responses or the stimuli are internal or external.

Can any sense be made of this tremendously complex situation? Are there any rules or principles that can be discerned which will make all such examples of the modification of behavior subject to clear understanding? In short, are there really any laws of learning that will apply to every instance of growth, development, and modification?

Let us take several further instances of behavior involving learning, that is, modification, at different levels of complexity, which will show the interaction of external and internal stimuli. Consider a mature man or woman striving to improve his score and efficiency in golf or tennis. There may or may not be a critic, guide, and teacher. But, in any case, it is clear that there is an intent or purpose, that there is practice, trial and error, and that there is improvement; at least, if there is not actual improvement, there is an intensification of greater assurance of a given level of skill. This is cer-

tainly learning, and there is certainly present an interest or drive. It may be directly economic, that is, relating to food, if it is a professional involved who is living by his skill. Also it is apparent, again by direct observation, that there is trial and practice, and it is likewise apparent that there is dissatisfaction when success or learning does not occur, and satisfaction when it does. But all this, as we have remarked, is at a highly conscious and deliberate level of behavior.

Secondly, let us consider a cat or other animal confined in a box or basket, egress from which can be had only if the animal, let us suppose, pulls a little ring hanging in one of the outer corners. Here, most certainly, there is no verbal statement of intent or purpose on the part of the animal to get out of the box, and we, the experimenters, cannot by talking to the animal arouse any such intent or purpose. Nonetheless, the cat will either get out of the basket or at least try to. So that, once more, we may say that the cat will either learn or at least try to learn. The first thing we notice in such a situation is that unless the cat becomes in some sense motivated, that is, unless a drive becomes operative, its behavior will be more or less non-adjustive. It may just lie down or wash its face. But suppose that we so control the environment that a drive does become operative. We can do this by placing a piece of fish within the range of olfactory receptivity. We shall then, provided the cat is hungry, notice a change in its behavior. Like the golfer mentioned above, he will react in terms of the drive, and the internal stimulus from the tissue condition will lead the cat to indulge in all sorts of diffuse and random behavior. It will claw the walls and the floor, brush against the sides, roll over, complain with plaintive meows or yowls. It will, in short, indulge in trial and error, though to be sure it is, at first, mostly error. Let us further assume that in the course of such random behavior, as is indeed easily observable in the laboratory, the cat does by chance pull the string attached to the ring. Up flies the lid, out goes the cat, down goes the fish. Now, whether the cat knows it or not, it has formed the beginning of a new pattern of adjustive behavior, but as yet it is not clear just how this has happened. But it is perfectly evident on observation that the cat which has gotten out once, by mere chance, will get out a little sooner if it is placed in the same situ-

ation, the same drive occurring, and the same reward following the successful effort. By and by, no sooner is the cat placed in the basket, than it can and will if a drive operates, get out.

This is perhaps an even better example than that of the golfer or tennis player because it is at a much simpler level. The whole problem is uncontaminated by remarks on the part of the experimenter, such as, "Do it this way"; "Don't do this"; "Keep this in mind"; and the like. And in all probability, it is also uncontaminated by any such reflections or verbalizations on the part of the cat itself. Let us consider also a modification of this experiment. Suppose we put a cat in the situation we have described and each time, from the very first, that it pulls the string and pops its head out, we slap it and push it back. It certainly is clear that it would require a very heroically hungry cat to persist in trying to learn how to get out. On the contrary, it would learn to stay put and just express an increasing degree of organic activity and irritability.

Consider still a third and different example. Let us suppose that a child is seated in a favorite chair at the breakfast table, eating its favorite food, surrounded by all its Lares and Penates in the form of family members, teddy bears, and the like. The child is hungry and is learning, as it has learned on previous mornings, to handle a spoon and glass without slopping or dropping things. Suddenly the experimenter approaches from behind the child and drops an excited rabbit, splash, in the bowl of breakfast food. It would be an extraordinary child who would not burst into tears, stop eating, and go into more or less random and diffuse behavior.

The next morning, let us say, when Johnny comes to the table to eat his breakfast the rabbit is visible either in someone's arms or in a cage on the other side of the table. It would, again, be an extraordinary child who would just placidly continue to eat his breakfast. In other words, the child has learned through experience to be afraid of and to be inhibited by a rabbit. That is to say, one experience has made some change in the connector system, so that the child is more or less permanently different as a result of the experience. And certainly no amount of verbalization on the part either of the child or the parents will wipe out this experience, though, of course, further learning can result in a continuance of more or less normal

breakfast behavior. Here, too, a drive was involved, an experience occurred in connection with it which, though it was merely a single experience, was in effect the practice that brought about the resultant change.

Let us take still another example. Suppose that a dog is hungry and is actually smelling though not yet eating its dinner. We observe, furthermore, that the dog is drooling at the mouth as partial evidence of the involvement of its digestive system in terms of previous experience. While it is thus drooling, we ring a given bell, and while it is ringing we feed the dog. We do this several times, always under more or less the same circumstances. By and by we find that the ringing of the bell just by itself is sufficient to cause the animal to drool. This, too, is learning because the animal is now responding in the way it originally responded to the odor and sight, to a new auditory and experimentally introduced stimulus, namely, the sound of a bell. There are many modifications of this particular experiment in which the bell can be sounded during or at a stated interval before the feeding, and it is again clear that a drive is involved, practice and experience are involved, and satisfaction is involved. For it is apparent, from further experiment that no dog will keep on drooling indefinitely in response to the sound of a bell if it is not fed shortly subsequent to such a stimulus.

Now whether we call our example of the golf player conscious and deliberate learning, and that of the cat forced, experimental, and controlled learning, and, on the other hand, call the instance of the child and the rabbit an emotional shock conditioning, and the dog and the bell a biological, unintentional conditioning, makes no difference. They are all simply different varieties of learning in terms of our definition of learning; namely, that learning is modification of behavior brought about by the action and reaction of the organism and its needs with the environment and its forces. Depending on circumstances involved in the immediate experiment and the past experience resident in the organism, the golfer may continue to improve, go into a slump, or give up the game entirely. The cat may continue to be able, even after a long period of time has elapsed, to get out of the problem box, or he may quickly "lose" the ability he has learned. In any case, we know from further experiment, that what

has once been learned has made some sort of a permanent trace or difference in the nervous system, because we find that a person or animal who has once become proficient in a given situation, and then over a period of time become less so, can recover the former level of efficiency much more quickly than another person or animal that has not had the training in question can reach that level.

As for the child and the rabbit, other circumstances, not our immediate concern, will determine whether the one shock experience will die out, remain more or less at the same level, or spread and become a much bigger thing involving all furred objects. We may, for the moment, call the factors we have pointed out in the above instances of learning: Readiness, Exercise, and Effect. By readiness, we mean, of course, either a native drive such as hunger, which gives rise to the random behavior we have described out of which the correct adjustive response is finally selected; or by readiness, we may mean as broad a thing as interest, purpose, or plan, something that is not as native and fundamental as a drive, but which can, as we have indicated above, be traced back through many experiences to an actual drive. In short, a drive is either immediately and directly involved, or else indirectly involved through mechanisms and previous learnings which have now become (Woodworth) drives in their own rights. What we call the "wish" for prestige, power, what we call the "spirit of competition" and the like, are all ultimately related to fundamental drives and the whole principle of pleasure and pain.

The person who most thoroughly and consistently has developed the laws of learning under the above general terms, is Thorndike. Working with animals, and with human beings, he stated these three principles which we can rephrase, for our purposes, in a somewhat broader form. By readiness, we shall mean, not merely any positive desire on the part of the organism which may take the form of a simple drive as we have shown, or a mechanism and interest which has developed out of such a simple drive, but also a drive or desire or interest, not positive and acquisitive, but negative and withdrawing. To be sure, by withdrawing from a painful stimulus or an unpleasant situation, there is implicit a desire for another state of affairs. Some learning may actually take

place under complex conditions of pain and avoidance, as when a child learns a multiplication table or some dates, not because he is directly interested in the table and dates, but because he wishes to avoid a foreseen and previously experienced punishment.

An animal may also learn to run a maze in the complex terms of a desire for food plus a painful stimulation when wrong turns and trials are made. But, in every case, it is clear that whatever the environment offers in the way of pain or pleasure, these things are ultimately in some sense, aspects of the total environmental situation. Probably much learning, particularly in sophisticated and intelligent people who have gone through much previous learning, involves this kind of mixed readiness. The poet or inventor, for example, may forego much immediate pleasure for the sake of an anticipated larger gain represented in his organism by earlier-instilled patterns that we call ambition or the desire for fame. Probably only the simplest behavior is uncomplicated by such considerations, and often there can be such static ambivalence that little or no learning will result at all, other than the continuance and intensification of the static condition itself.

As regards the middle term, exercise or practice, this also varies from instance to instance of learning. One may learn a new but simple mechanical puzzle with but little practice. One will learn an intricate act such as throwing three or four balls in the air and catching them, only with much practice. Also it is clear that practice may often be related, however obscurely, to other learning acquired at some previous time, though this statement must be taken with certain qualifications that we shall present later. Transfer of training, which would be involved here, is not the simple "disciplining" of the mind which some people take it to be, but rather involves a complex situation with common elements in the new act and the old one.

The question of satisfaction has been perhaps more argued than either of the others. Why, for example, out of many and varied incorrect acts performed in the trial-and-error period of practice, does the one correct or approximately correct act become singled out for permanent use? As a matter of fact, we really practice or repeat the wrong act or acts a score or a hundred times, but we do not really learn the act

until we perform correctly. We have, so to speak, in the intermediate stages, temporarily learned wrong acts, but with such wrong acts, if we are learning under capable tutelage or with adequate standards in mind, dissatisfaction, irritation, and the like are involved. When the cat we mentioned above inadvertently or by chance pulls the string that releases it, satisfaction is associated with that act. It has not, however, on the first such success, really learned the act; further repetition and further success are necessary.

What then happens to make it more likely that the successful act will finally be fixed in the nervous system? That is, what is the organic or neural correlate of satisfaction? We can only assume, though it seems reasonable in terms of our knowledge of the nervous system, that any circuit that is, at any instant, actually operating, remains open from receptor to effector for a brief period of time immediately subsequent to the action of that circuit. To put it another way, the plug is not pulled from the switchboard the moment a connection is made. This circuit, then, being briefly still open, the stimuli of eating and the attendant organic satisfaction will go out through this still open circuit and intensify it.

We see this principle clearly illustrated in the learning, by a rat, of a maze, or in the reciting of a poem by a child. The rat seems to become definitely oriented with reference to the last turn which immediately precedes the satisfaction of finding his food or his mate. Having learned that last turn, however, it has become so fixed through exercise and effect that it literally becomes a habit. His next problem is then the turn preceding the last, and so on backward, allowing, of course, for individual variations in different rats under different circumstances. He may sometimes stamp in two turns at a time. The child, too, may have to be prompted all through the early part of a poem he is endeavoring to recite, and then literally gallop through the last line or so which brings either the positive reward or praise or the negative reward that he is through with an unpleasant task. We see it, too, in adults who have learned a long poem; for some time there will be points in the recitation beyond which they cannot seem to go. So clear is this in experimental work that it has become something of an adage in memorizing, that it is best not to use all the time

available in one period but to divide up the time, so that we may find out where the weak connections are and strengthen them with a sort of subsidiary satisfaction.

Our remarks on the fact that the last-used circuit preceding satisfaction, positive or negative, actually intensifies that last circuit leads us directly into a consideration of the other kinds of learning we have mentioned, such as a child acquiring through one instance of experience a fear of a rabbit. Here the name of Pavlov, the Russian physiologist, comes to mind. The best statement for our purposes of the general meaning of Pavlov's experiments is as follows: if any given circuit involving an afferent sensory path, a connector path, and a motor efferent path, is active and open and functioning, then any other afferent sensory impulse occurring at the same or at very nearly the same time will tend to go out the same motor path that was already open and functioning. This merely means that any number of entering stimuli can, conceivably, depending on the conditions of the organism and the environment at the moment, go out a common path. Much of our learning, as we have said, is of this kind. The sight or the sound or the touch of a given furry object can all result either in the word "cat" or in an inner reaction of fear.

Reverting to the example given above of the boy and his breakfast and the rabbit, the situation is a little more complex, but it is to be understood in terms of these general principles. Thus, the sudden and unexpected appearance of the rabbit in his breakfast dish gives rise, because of his unpreparedness and the overloading of his circuits already working, to an inner reaction-pattern of fear, thus adding to the response-circuit. The sight and the sound and the touch of the rabbit occurring simultaneously likewise go out this inner efferent reaction-pattern of fear. Thus, a conditioned response is formed by one occurrence. Only in a verbal or common-sense interpretation did the rabbit cause the fear. The rabbit was merely a particular instance of a sudden and unexpected and overbearing stimulus causing the inner and additional response of fear. The rabbit was a mere happening in the environment; it might have been a cat or a football or a wet towel. It was the organism that formed the circuit under the given conditions. But other things being equal, the child will thereafter

react with fear to the sight or the sound or the touch of a rabbit, or if additional conditioning takes place, to the mere word "rabbit." In fact, it is perfectly possible to set up motor and emotional paths of discharge that are set off merely by words even though no concrete experience of the thing which the word stands for has ever occurred. Many people who react emotionally to the word "snake" have never actually experienced any concrete situation or stimuli involving snakes.

Many common fears and superstitions are simply conditioned responses to mere words. "Ghost," "communist," "nazi," "hell," "wrong," "bad," "nasty," are words to which we learn reactions through devious and complex conditioning-situations, for which there has been no actual but only a substitute basis in experience, though pleasure and pain, satisfaction and dissatisfaction, have been involved, as well as, often, long practice. Such conditionings or such instances of learning and modification may last a long time or, through further experience and learning, be modified and changed. The dog who drools at the sound of a bell will not continue to thus drool indefinitely unless some actual satisfaction in the form of food is given. Such a simple conditioning will just die out, but it is easily re-established by further instances similar to the original. In the case of the boy who is frightened by the rabbit or the adult who reacts with fear to mere words, it is not always easy to show what satisfaction or dissatisfaction is involved. But careful analysis of such cases shows that the motor and emotional reactions of fear do involve some sense of security or withdrawal which is satisfactory. The boy who is afraid of the dark, while not directly satisfying a drive in the primitive sense, is nonetheless avoiding dangers and pains which, though imaginary in reality, are still psychologically real.

This leads us to the question of certain criticisms of the whole readiness-exercise-effect theory as here presented. Tolman, for example, has made a criticism of this readiness-exercise-effect theory on the basis of certain experiments involving pain, a point we have already, in part, anticipated. First of all, it is clear that we do not always avoid pain, though common sense and everyday observation clearly show it is often a deterrent. The old adage that the burned child dreads the fire is true enough, but James

once remarked that if one knew that a severe pain in an eyeball meant the recovery of lost sight, that pain would be welcome and even sought out. We must also remember that many pains are only a partial aspect of a situation. We do a job we know we must do, even though we are tired and have a headache, because through previous learning and conditioning we realize that the ultimate end is worth achieving in spite of the present pain, and will bring ultimately a satisfaction and reward which will quite eclipse that pain. It would seem that the experiments which Tolman and others set up, involved just this complexity and hierarchy of pleasures and pains, and really go to prove Thorndike's laws when the whole, and not merely a part, of the situation is taken into account. For, in his experiments, even though the right steps were accompanied by pain, nonetheless there was a more powerful pleasure element involved, namely, the satisfaction of learning in spite of difficulties and deterrents. We have already remarked, and here emphatically repeat, that as the young animal, human or otherwise, grows older and more experienced, and has a greater and greater background of previous learning in the form of memory patterns, every stimulus is very complex and made up of many competing, divergent but nonetheless integrated elements. And likewise with responses. One may persevere through many years of adversity, pain, and suffering because of a fancied reward so utterly satisfactory in the mere contemplation that it takes precedence over all the deterrents. One will go through fire to save cherished possessions or dear friends. One will suffer the fears and privations of war because of the sense of satisfaction in serving one's country.

Another criticism of Thorndike's and Pavlov's eminently simple generalizations is that of the group of Gestaltists. The Gestalt school is loosely critical of the mechanical aspect of the interaction of the organism and the environment to such a degree that it almost seems, at times, that they deny determinism and the concrete relationships of the structure and function of the organism in relation to the environment, and seem to imply a sort of vitalism or mysticism. They seem to take the position that the real interacting factors are the forces resident in the body and in the environment so that the orderliness and integration of the or-

ganism and the environment appear to them to be a function of these forces, rather than the learning and modification of the organism in terms of the diversities of the stimulating environment. This may be merely a matter of language, and it is perhaps true that the Gestaltists add something to our understanding of learning in that they stress the complexities of action and reaction. But in this stress they seem often to deny or misinterpret the easily observed facts. They stress the interplay of forces, rather than the constantly changing action and reaction of receptors, connectors, and effectors in terms of these forces. They also seem to assume at times an inner predisposition to accept and react to a given stimulus or situation rather than analyzing the process whereby a situation through long trial and error has come to have a certain response. Take, for example, the word "COP." This, to an English-speaking person, is a gestalt or pattern to which he will react, in part, with a verbal-motor response, based on much experience and learning, as "policeman." To a Russian, however, with a different set of experiences and learnings, the response will be pronounced "sor," meaning "dirt" or "litter." It is a gestalt or pattern, to be sure, in each language, but it is nothing inherent and unlearned but is, on the contrary, the result of much learning. In short, depending on previous experience, we can learn wholes or parts.

Again, a child ultimately learns, as a result of much experience, that a triangle has three sides, a square four, and that a given rhythm is two-four or three-four. In other words, abstractions, forms, and relationships are as much a matter of learning as any simple concrete response. The appreciation of and reaction to form does summarize and integrate a large amount of experience, but such ability is the result of all underlying, previously learned concrete stimulus-response situations and is in no sense *a priori*. Köhler's apes quite evidently learned through experience both to join sticks together, which they had not learned previously, or to pile boxes upon one another, which they had not done before, but to call such things "insight" or the sudden formation of a gestalt, is merely to give them a new name and add nothing to their understanding. Without some previous experience of sticks and boxes they would not have had the insight nor would they have learned to solve their problem.

This brings us again to the question of higher integration in learning. We have already said that many entering, afferent impulses can and do, under the proper conditions, find a common exit. This is due to the very nature of the nervous system as well as to the chances of the environment. When Newton drew the conclusion from a falling apple that gravity held the solar system together it was, in one sense of the word, insight. But it should be noted that there were common elements involved in the circuits in question, such as the roundness of all the objects involved, plus the fact that the apple approached the earth. Newton had, to be sure, a sensitive nervous system, and much learning and experience of intricate and related cogency, and it just happened at that moment that they were grouped under a common heading and found expression in a common response. We may call this "thinking," but it is also learning. So we may say that the ability to draw certain far-reaching conclusions, in any abstract field of thinking or learning, is a very complex function of much related previous learning and the stimulating situation at the moment.

It should be clear that thinking is itself a trial and error performance, a special instance of adjustment or learning, in which there is not necessarily so much direct motor manipulation as in the instance of the golfer or the cat in the box, but rather a sort of indirect manipulation, through substitute stimuli and responses, such as words. We could not, for example, solve a problem involving a choice that will have future consequences merely by immediate, present, motor manipulation. Let us suppose that we have to decide where to go for a vacation a year from now and that we have two or three competing plans. We cannot, like the cat, concretely push and pull here and there or, like the rat, physically, at the moment, try this turn and that, but rather, we have to use counters and words in the effort to solve the problem. There is a drive present; there is a future satisfaction aimed at, but we have no guarantee it will ultimately arrive, and we cannot know, as in case of immediate mechanical situations, that we are right. Here the satisfaction is verbal and logical, but it is still satisfaction, in some sense, to solve some problems even thus. Whether we were right or wrong we shall have learned something, made further changes in the nervous

system and integrated ourselves better or not so well to the total complex environment. At least, an annoying state of affairs will be dissipated, verbally.

This leads us to a consideration of so-called purposive or teleological theories of learning in which again it seems as if a certain mysticism is present. What is called purpose is really, biologically and neurologically, a present set to solve a situation in the future. It is clearly impossible for a purpose to be other than a present and momentary set and integration of the organism, which fundamentally means, when we trace it back, either a drive, or a mechanism so strongly entrenched that, in Woodworth's phrase, it has itself become a drive. My purpose or intent to buy or prepare a meal is clearly merely the realization that I am hungry and am going to do something about it. The purpose has no mystic subsistence or existence apart from the make-up of the organism, and apart from such drive or mechanism. It is merely a matter of the awareness of a situation and the awareness of what to do about it, which are themselves matters of learning. And it is perfectly clear that in such situations many unforeseen factors may deflect the organism from satisfaction so that more learning will have to be acquired.

Take, for example, the question of learning to hit a bull's eye. The desire is there as a result of many complex former experiences, and the desire may in this case properly be called a purpose, but mere desire or mere purpose is not enough. We intend or purpose to hit the bull's eye with the first bullet we fire, but through neglect of such factors as lighting, the wind, our tendency to twitch, we do not hit it. The expert marksman is one whose learning is more commensurate with his intent or purpose, and even he may be thrown off in his achievement by new and hitherto unexperienced factors so that he will have to learn and integrate still further. All such efforts to ignore the simple and demonstrable facts of learning simply confuse the fundamental issue, namely, that there is an organism in an environment, and that it is the conditions of the organism and the environment respectively which bring about whatever result does occur. In short, we cannot escape the fact that the animal, human or otherwise, because of its very organic nature will strive to escape pain and to achieve satisfaction.

in terms, at each stage, of previous modifications and learning.

Certain other subsidiary matters remain to be briefly discussed, namely, imitation, the ideomotor theory, and the question of "discipline" of the mind. As Thorndike properly remarks the child does not, in learning to write, imitate the writing of the teacher, because if the child had the ability to write as the teacher writes, it would not be imitation except in so loose a sense that there would be no significance in the term. What really happens is that the child, provided the desire or intent is present either to achieve success or avoid punishment, is simply stimulated by the agile and capable performance of the teacher. He then goes through a trial-and-error process in which, let us suppose, he is more and more successful so that his writing comes to resemble, more and more closely, the supposedly ideal specimen on the blackboard. But this is learning. If he is successful and gets praise he goes on with more learning; if he is punished and humiliated he may never learn. Readiness, exercise, and effect are always clearly present. One cannot imitate an expert in anything; one can only learn to approach a goal if there is interest, if there is practice, if there is satisfaction, and if it is within the possibilities of the individual to approximate more and more closely to the standard. To be sure, if I raise my right hand, almost anyone who has a right hand can do the same thing, but this is not learning through imitation, but reacting to a stimulus in terms of similar pre-learned abilities.

The ideomotor theory is another instance of misconception. If I tell someone to raise his right hand my words may, to be sure, cause such an act, but only if previous experience and learning have joined such a verbal stimulus to such a motor response. Were I to say it in a foreign language, unknown to the person to whom I give the command, no such response would follow. Words lead to motor reactions only when previous experience and conditioning have established such circuits. To tell Johnny, in words, to be "good," can only lead to such responses as have previously been joined to such a stimulus. To tell a person to be "calm," does not result in his being calm by any magic of the words. To tell a nervous person, "Don't be nervous," cannot have the intended or desired effect on his behavior, unless that phrase, by

long learning, is a touch-off signal for circuits and conditionings which will then function. In short, there is no necessary relationship between words and action but only a specific relationship as a result of previous experience and learning. One may indeed have a very extensive and delicate verbal knowledge of a given field even to the extent of being able to pass severe examinations therein, and yet be unable to perform other than verbally in that field. A verbal expert on how to run an automobile is not, therefore, a good driver, and contrariwise, the real motor expert who responds to cues and stimuli that are not verbal, may not be able to put into words what it is all about. A good painter may be a poor critic.

The question of "discipline" of the mind, like that of the ideomotor theory, has plagued the whole world of directed learning or education, for long long periods of time. The learning of Latin, for example, and the achievement of expertness in the field requires an arduous and long-continuous period of learning, and the formation of many and interrelated bonds, circuits, and connections. Let us suppose one has become a scholar in the field of Latin, and that one's accuracy of judgment, delicacy of perception, is vast. It should be clear that this accuracy and delicacy are a function of the many specific bonds and connections involved. One cannot just transfer this accuracy and delicacy to another field. It is quite broadly and popularly so conceived. An eminent physicist is often, alas, given credit for profundity because of his work in physics, when he writes a book on politics or religion. But his opinion and judgment in politics or religion will depend, in the main, on his experiences and learning and connections in these specific fields.

One can look at this problem from another point of view. The excellence in the field of physics is due to certain mechanisms, habits of thought and procedure in a given field of knowledge. The same techniques and mechanisms can, to be sure, be used in more than one field. The habit, for example, of examining premises, the habit of carefully gathering data, of testing each step in a procedure, would apply to many fields from chess to chemistry. So that one could readily say that a person of careful habit of thought and procedure could easily learn to become a master of another field if he used the same procedures in that field. But he

would still have to learn and become intimately familiar with the detailed data and relationships in the new field. But this is not what is usually meant by "disciplining" the mind or transfer of training. In short, we must say again, wherever one wishes to learn, one must have the desire or incentive, go through the necessary period of practice, and achieve sufficient satisfaction to stamp in the bonds and circuits.

This, then, is the story of learning or the inter-active modification of organism and environment. We have, to be sure, omitted the details of experiment, the niceties of criticism, and taken for granted some characteristics of the nervous system for which immediate and direct proof is at present lacking. But, by and large, both theory and practice agree in this: that we learn because we have an inner need to do so, that we have opportunity to bring it about, and that we find it worth while and satisfying. Without a drive or motive, fundamental or later acquired, without the final satisfaction of better adjustment, positive or negative, and without the intermediate trial and error process, we should be, not growing, adjusting, learning organisms, but mere passive objects completely under the control of the environment.

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LEARNING CURVES, COMPUTATIONS IN COMBINING.—The purpose of this article is to describe for the student computations involved in various methods of combining individual learning records. The methods are described briefly for purposes of reference. They have been described, compared and evaluated by Hilgard (1938) and there does not seem to be a need for simply repeating his material here.

Learning scores cannot be simply added together because different individuals take different numbers of trials to reach whatever criterion may be used; nor can the experimenter use the same number of trials for each subject because different subjects would, in any given number of trials, have progressed to different points on their way towards mastery. The first solution for this difficulty was offered by Vincent (1912) who divided each record into tenths and then combined scores for the first

tenth, etc. If the number of trials in a record is an even multiple of ten there is no difficulty in deciding on the individual's score for each tenth. With other numbers of trials the question arises as to the correct procedure. Vincent simply took trials over the highest multiple of ten and increased the number of trials per tenth by one for enough tenths to take care of the extra trials, starting with the first tenth. For instance, a record with 32 trials would have 4 trials in the first tenth, the next four trials would be called the second tenth, and each of the succeeding tenths would contain three trials. Later modifications have interpolated on the theory that the amount learned per trial was evenly distributed over the trial.

Hunter (1917, 1934) was the first to use fractions of trials. If a record contains 32 trials he takes 3 trials and .2 of the next trial for the first tenth of the learning. He adds together the number of errors contained in 3.2 trials and uses this score as a measure of the amount of learning done during the first tenth. The second tenth contains the number of errors made during the next 3.2 trials. Loucks (1931) divides the number of errors in the tenth by the number of trials in that tenth, giving the number of errors per trial for each tenth. Hilgard and Campbell (1937) divide the number of errors per tenth by the total number of errors in the record and multiply by 100, giving the per cent of the errors made during the tenth. These procedures can be used with successes or with units of time as well as with errors.

Instead of calculating the score made during a tenth of the learning Kjerstad (1919) used the score reached at the end of each successive tenth. A graph is made for each record, using the abscissa for units of practice and the ordinate for units of learning, and the abscissa is divided into tenths. Each subject's score at the first tenth is read from the graph, these first-tenth scores are averaged, and the resultant is used for the location of the composite's first-tenth point. The next point on the composite graph is the average of the points reached by the end of the second tenth of the learning of the individuals. Where the Hunter procedures give a simple frequency graph the Kjerstad procedure gives an accumulated frequency graph.

In making Kjerstad graphs of individual records one may use any convenient interval and

after drawing the curve divide the abscissa into the number of fractions desired (ten in the examples used in this paper, but any number can be used). Instead of using convenient intervals on the abscissa it is desirable to stretch the graph to fit the whole length of whatever abscissa axis the paper provides. The abscissa is then divided up and the scores read off as above. This has the advantage of making the graph as long as the paper will allow and, of course, greater length permits more accurate reading. On the same grounds the ordinate units should be as large as possible.

Melton has prepared tables to simplify the graphing, assuming the use of an abscissa axis with 200 divisions, usually 200 mm. For each possible number of trials a table gives the number of divisions to be used for each successive trial in order to end exactly at the end of the paper.

Hunter-Vincent curves and their modifications use arithmetic in calculating their various points, but it seems usual to calculate Kjerstad-Vincent values graphically. These latter can also be done arithmetically and some workers may think that the arithmetic method is cheaper in terms of time and paper, and perhaps more accurate.

It is usual to assume with the Kjerstad procedure that the number of syllables correctly recited on one trial is the number learned by the end of the previous trial; so we may renumbers of correct anticipations in learning to the material is Trial No. 0, the next, the first chance to recite, is Trial No. 1, etc. Divide the total number of trials required for learning by the number of divisions desired. Multiply the quotients by the numerators of the respective successive fractions. Each of the resulting products will indicate (to the left of the decimal point) the number of trials and (to the right of the decimal point) the part of the gain on the next trial which will give the desired value.

The details of the procedure may be clarified by an example. A subject makes the following numbers of correct anticipations in learning 10 items: 0, 2, 5, 3, 6, 7, 5, 7, 8, 6, 9, 9, 8, 10. There are 14 trials including the criterial trial. Any learning which may have taken place during the last trial is not measured. The subject learned in 13 trials. Renumbering, Trial No. 1 would be that on which the score was 2; Trial

No. 2 would be that on which the score was 5; etc. If the record is to be divided into tenths each tenth will include 1.3 trials.¹ The score at the end of the first tenth will be the score at the end of Trial No. 1 (which was 2) plus .3 of the gain from Trial No. 1 to Trial No. 2. The gain is 3 and .3 of this is .9; adding, we have 2.9 for the score at the end of the first tenth of the learning. Similarly, the scores at the ends of the successive tenths are (repeating the one just found) 2.9, 3.8, 5.7, 6.6, 6.0, 7.8, 6.3, 9.0, 8.3, 10. If the example is worked out graphically it will be found that the values are the same. A graph made from these values will start at the first tenth of the learning. Zero can be used as a starting point for the graph on the theory that the subject knew none of these items before the learning started, which will give a curve containing ten parts instead of the nine we would get with the ten values given above.

The example given is in terms of successes, but exactly the same thing can be done with errors or with time units, except that the point from which the first tenth of the curve starts cannot, of course, be zero. We can assume, however, that the first score of the original record (before renumbering) represents the performance with no learning, and use it for a starting point. This is not done by Hunter (1934), Loucks (1931), nor Hilgard and Campbell (1937), although Hilgard recommends it (1938, p. 294).

Bills (1934, 196-7) has suggested a method of adapting the Kjerstad procedure to error scores. Actually, his suggestion does not do this. Instead of using his first score as a starting point he uses it as a measure of learning. The sample graphs he gives are presented as dividing the learning into fifths. However, he has added an imaginary trial at the beginning of each record and taken a fifth of the actual number of trials plus one. Hilgard (1938, 285) gives an illustration of Bills' procedure, and apparently

¹ It will be found convenient to prepare a card for each possible number of trials to learn, giving the number of trials to be included in each successive fraction. If there are to be ten divisions the card can be made easily from a multiplication table which goes up to 100×100 , simply starting with, e.g., 32, when there are that many trials in the learning, copying down the numbers under that multiplicand, and inserting a decimal point in

repeats the addition of the imaginary trial at the start, but since he discards the final trial this does not change the number of trials included in each fraction of the learning.

If Kjerstad's graphic method is to be applied to error scores it is essential that the first trial be considered as a base line instead of a measure of learning, and that the first criterial trial be included as the final point on the curve. If it is objected that this latter trial is subject to a special limitation in that by definition it must be higher than the just-preceding trial, we cannot discard the trial, we must discard the section of the curve which includes it.² Melton has pointed out that this limitation produces an artifactual end-spurt in the curve of successes (1936). The end-spurt can be avoided when the shape of the latter part of the curve is important by his procedure of counting trials required to reach a given fraction of the criterion instead of counting scores reached at the ends of given fractions of the trials required to reach the criterion, but this introduces a starting-spurt, and it gives a curve which must always go up and can never go down.

It has been said that it is probably undesirable to have part of a trial making up a complete fraction of the learning; so one should have more trials in each record than divisions of the records. Care should be taken not to cover up significant features of the learning (such as plateaus, for example) by combining records. For discussion of both these points the reader is referred to Hilgard's 1938 article.

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LIE DETECTION — ITS BODILY BASIS AND TEST PROCEDURES.—It is elementary but important to remind the reader at the beginning that "deception," hereafter discussed, is assumed to be a *conscious* act. Errors of fact or understanding, pathological lapses of memory or responses resulting in deception but with abnormal motivation like those of the psychopathic liar, form no part of our present detection problem. For the purpose of this discussion a "lie" may be defined as a mental, verbal, or bodily response of *conscious* deception.

I. CRITERIA OF DECEPTION

1. *Commonly Observed Behavior.* This consists of bodily movements or verbal responses which may be observed without the aid of instruments or scientific apparatus and which may be voluntarily controlled and altered by the deceiver. No two sets of voluntary responses during deception are precisely similar. Whether or not this voluntary behavior is symptomatic of deception or of some other type of response can only be *guessed* by the observer.

Two general groups of behavior symptoms are commonly considered to be symptomatic of deception; fear reactions and dominant defensive responses. Voluntary fear behavior is generally assumed to include the following reactions: running away; looking guilty, confused, panic-stricken; making inconsistent statements; delaying or hesitating in answering questions. Subjects who react thus are partially defeated by the stimulus situation and in consequence they behave less efficiently.

² Hilgard (1938) calls attention to the fact that if the criterion contains more than one trial, the trial preceding the criterion also has a special limitation in that it must be below the level of the succeeding trial, whereas the second trial preceding the first criterial trial may be at the criterial level. The trial preceding the first criterial trial may go down, but cannot go up.

This type of behavior has been used since the earliest records of man as ipso facto evidence of guilt. Such reactions are admissible in court as evidence in determining whether or not a defendant, accused person, or cross-examined witness is guilty of criminal or deceptive conduct. In some cases, no doubt, an assumption of guilt may be justified. In other cases, however, such weak and fugitive reactions do not evidence guilt. These behavior symptoms ipso facto are evidence of fear only, and fear is aroused to greater or less degree in every person who knows he is suspected of crime or deception, whether he is guilty or innocent.

A second type of behavior commonly observed is the dominantly defensive pattern of reaction. A murderer may face his accusers boldly. He may manufacture a clever alibi for himself, furnish false clues, or destroy clues which point to his own guilt. He may manage to appear innocent in face and manner. He may elect to run away; but if he does so, his flight will be well planned and cleverly executed. Subjects in this group master the stimulus situation and act dominantly to divert suspicion or conviction of guilt from themselves.

2. *Scientific Criteria of Deception.* By means of scientific instruments and laboratory procedure, *involuntary* movements of a subject's body may be detected and recorded. Such behavior cannot be controlled by the would-be deceiver. Involuntary responses symptomatic of deception may be mental reactions or changes in bodily or physiological activities such as breathing, heart beat, glandular secretion, or other visceral changes. In general, these internal bodily responses are mediated by the autonomic or "sympathetic" nervous system which is not under voluntary control. In using such involuntary responses to detect lies, two problems are encountered. First, the discovery of reactions which invariably accompany deception; and secondly, the correct interpretation of the total pattern of involuntary responses recorded in light of the stimuli which evoked them. Provided these two problems are solved, involuntary bodily responses may be expected to furnish scientifically reliable criteria of deception.

II. PROCEDURES FOR DETECTING DECEPTION

1. *Legal and Police Methods.* First we find police, detectives, lawyers, judges, juries, and other crime investigators observing the behavior

of suspects for the purpose of discovering reactions of the fear type which may be accepted as guilt.

Second, various tortures, called the "third degree," are used to force a suspect to confess to a crime or deception with which he is charged. The errors in both these methods are obvious. Neither evidence of fear behavior nor pain-impelled confession offers reliable proof of guilt. Decisions by a jury unaided by scientific criteria of deception proved to be less than 50 per cent correct during Marston's early experiments in the detection of deception in the Harvard Psychological Laboratory (*Systolic Blood Pressure Symptoms of Deception*; J. of Experimental Psy. 1917, Vol. II, p. 112).

2. *Scientific Procedures.* With one exception, all scientific procedures reported to the literature have attempted to detect bodily symptoms of emotional disturbances caused by or accompanying deception. Six thousand years before the birth of science as we know it today, the Chinese used a rice-chewing test to determine the truth or falsity of an accused person's testimony. The subject was required to chew rice for a certain length of time and was then told to swallow it. If he could do so, he was assumed to be innocent. If he could not, he was adjudged guilty. The reaction which these primitive investigators were unknowingly testing was the effect of fear upon the secretion of the salivary glands. If a suspect could swallow rice, it meant that the saliva was flowing freely into his mouth. If he could not swallow it, it meant that his fear was inhibiting the salivary secretion. The test actually consisted of observing in a crude way a glandular reaction symptomatic of fear. But the Chinese, in all probability, had no idea that they were dealing with any such reactions. Consciously, they were only trying to discover some unknown variety of emotion caused by lying.

Lombroso suggested that the measurement of blood volume and pulse by a plethysmograph type of apparatus might detect guilt in criminals, stating that he had tried this in one criminal case.

Binet, using similar apparatus, noted similar effects produced by emotions accompanying suspense and tension in a subject who had before him an unopened letter containing news of the expected birth of his child.

Cellini mentioned in his autobiography that

his father noticed a marked effect on his pulse, while the child was ill, at the mention of Benvenuto's musical performances.

These observations are historically interesting insofar as they suggest the possible influence of general emotional tensions upon blood circulation phenomena, but in actual fact they seem to have had no bearing whatever upon subsequent researches seeking to discover identifiable deceptive emotional reactions.

During the nineteenth century specific scientific tests for various emotional excitements caused by varied stimuli, including those of deception, were attempted in psychological and physiological laboratories. The psychogalvanic reaction, as measured by the galvanometer, was found to be symptomatic of almost every type of emotional reaction. This test apparently measures changes in the amount of sweat secretion in a skin area through which a low voltage electric current is passed. Movement of the big toe, involuntary gripping of the hand and salivary secretion measured by scientific techniques were similarly investigated and found to be, in varying degrees, reliably correlated with general emotional disturbance.

In the late 1890's the first scientific test for fear type reactions caused by deception was developed simultaneously in widely separated psychological laboratories by Jung and Wertheimer. This became known as the association reaction-time test. It consisted of reading to the subject a list of words some of which related to the crime or subject of deception and some of which did not. The subject was instructed to reply to each word with the first associated word which occurred to his mind. The time elapsing between the experimenter's pronouncement of a stimulus word and the subject's response was recorded by a stop watch or chronoscope in fractions of a second (tenths to thousandths, depending on the apparatus used). The theory of the test was this. If the stimulus word aroused fear in the subject's mind because it was related in some way to the crime or guilty act which he was attempting to conceal, his reaction would be delayed. Therefore, if a subject's reactions to crucial words were significantly slower on the average than were his reactions to irrelevant words, he would be adjudged guilty of attempted deception. This clearly was an attempted scientific test of the fear type of behavior above discussed.

Later tests of the same type proposed by psychological investigators were a shifty-eye test and the involuntary movement test. The first, devised by Dr. Henry T. Moore at Dartmouth, consisted of recording a subject's eye movements while being questioned. If he turned his eyes away from the examiner during crucial questions, he was assumed to be deceiving.

The first tests of emotions accompanying dominant defense behavior during deception were the respiration and blood pressure tests. Vittorio Benussi, working at the University of Graz, reported that respiration varied in a significant manner under influence of deception. The ratio of inspiration divided by expiration, he said, was greater *after* lying than before; but was greater *before* truth telling than after. He also stated that a clever or successful liar showed more pronounced variations of the type described than did a weak, fearful, and unsuccessful liar. Benussi's procedure, therefore, was designed to test dominant defense behavior.

In 1915 Marston, working in the Harvard Psychological Laboratory, reported that systolic blood pressure increased significantly during deception, the increase being greater with efficient liars than with ineffective deceivers. In 107 cases judged simultaneously by the blood pressure test and a jury, the test failed four times while the juries failed fifty-four times. Marston held that the blood pressure symptoms of deception constituted a test of dominant emotion accompanying the extra effort necessary to deceive with consequent release of additional nervous energy. Marston also reported as a result of research on some two hundred laboratory subjects that the systolic blood pressure curve symptomatic of deception rises in a characteristic form to a peak near the point of greatest effort and most intense dominant emotion motivating the deceptive act. This phenomenon has been called by later investigators the "peak of tension."

At the beginning of this section on scientific procedures an exception was noted to the psychological type of research in deception. Dr. R. E. House, a Texas obstetrician, attempted to compel suspects to tell the truth by injecting scopolamin. This type of procedure is a scientific extension of police methods designed to break down a subject's resistance and compel

confession. House himself, reporting his results in 1922, called his method "A Truth Serum Third Degree." House gave three injections of scopolamin and two hours later questioned the subject. He admitted that "you can obtain the same effect—with chloroform, gas or ether, but scopolamin is preferable because its effects wear off more slowly than any other anesthetic." That loquacity can be caused by drugs or alcohol has never been disputed. But psychologists generally agree with Larson that "under the influence of an anesthetic or sedative—a patient may talk freely with a resultant mixture of truth and falsehood." In a scopolamin test conducted by Larson in San Quentin prison, a convict "confessed" that the examiner was implicated in his crime. It seems obvious that the truth or falsity of drugged responses still remain to be detected by some different type of procedure. Moreover, even if proven true, confessions thus obtained are not admissible in court because the subject is not in a normal mental condition while confessing.

3. *Laboratory Examination of Scientific Procedures.* Critical investigations of the most promising scientific test procedures have been made as follows. Prior to 1920 the psychogalvanic reflex as a criterion of deception had been tested by a number of investigators and discarded because of its oversensitivity and difficulties of technique. But in 1936 Father Walter E. Summers, S.J., Ph.D., reported successful experimental results with this test in the Fordham University psychological laboratory, using a modernized apparatus for recording psychogalvanic reflexes. The principle of the test remained unchanged. Dr. Summers' procedure was to ask the same crucial question twice, recording the psycho-galvanometric variations accompanying the subject's responses. If the subject were lying, the galvanometric reaction was said to be greater the second time than the first; whereas if he told the truth, the second reaction was smaller than the first. Using this criterion in laboratory experiments with artificially devised deceptive situations, Summers reported 98 to 100 per cent reliable detection of deception.¹

Other investigators have failed to verify the

high reliability of this test. Inbau writes: "In detection of deception cases of an experimental type (i.e., card tests, etc.) such responses afford very reliable criteria of deception. But in actual cases—the electrodermal responses have not been found to be of much practical value as deception criteria."

The psycho-galvanic reflex is an extremely sensitive indicator of undifferentiated emotional response but has not been found to respond specifically or in any characteristic way to the deception stimulus situation.

The word association reaction-time test proposed by Jung and Waltheimer was investigated in more than twenty psychological laboratories throughout the United States; also in several laboratories in Germany, France, and Italy. Besides the experiments with this test reported in the literature, there probably were many hundreds of unrecorded class-room experiments in American colleges. Review of all available reports of these widely scattered experiments shows that the association test failed to indicate deception in approximately 25 per cent of the cases where deception was present. In 1913 Marston conducted experiments at Harvard for the purpose of discovering the cause of this 25 per cent failure. Using a more carefully controlled laboratory technique than is possible in applied tests, he found that approximately 25 per cent of his subjects responded more quickly to the crucial or deception stimulus words than they did to the irrelevant or control words. Marston concluded that one person in four lies faster than he tells the truth. Slow liars are delayed by fear and mental confusion; i.e., they are partially defeated by the stimulus situation. Rapidly responding liars react dominantly, conquering the situation and releasing nervous energy to meet the menace of detection.

Benussi's proposed respiration test was investigated by Dr. Harold E. Burt, who devised an improved technique for determining the inspiration-expiration ratio. Burt concluded that Benussi's criterion, if practically obtainable, promised considerable reliability in detecting deception. But he further concluded that this respiratory test was of less diagnostic value than the blood pressure technique.

Marston's proposed systolic blood pressure test for deception has been investigated by a considerable number of research psychologists

¹ *Science Can Get Confession*, by Rev. Walter G. Summers, S.J., Ph.D.; *Fordham Law Rev.*, Vol. VIII, No. 3, 334.

and physiologists. Most of these researchers used some modification of the original apparatus, making simultaneous blood pressure and respiratory records. Marston's first research included a determination of blood pressure by the intermittent method using a Tyco's sphygmomanometer and also a series of recordings of circulatory phenomena—blood pressure, pulse rate, and blood volume by the continuous method using an instrument of the Erlanger type which recorded its variations on a smoked kymograph drum. In his published reports, however, Marston mentioned only the Tyco's technique, which he believed more effective, taking four or five readings of the subject's systolic blood pressure to the minute and noting them in figures on paper.

Dr. John A. Larson, working in the police laboratory at Berkeley, California, repeated Marston's experiments, using the continuous blood pressure method with an Erlanger sphygmomanometer. He reported that a comparison of the two methods showed the continuous recording to be more reliable because it largely eliminated the individual error of the operator when taking blood pressure. Since this method gave no quantitative determination of the blood pressure level at any time, Larson took the blood pressure with a Tyco's at the beginning and end of his test and also at other intervals. Larson also combined with the blood record a respiration record taken simultaneously by means of the usual pneumograph tube and recording kymograph drum. This also had been done originally by Marston and by Marston, Burtt, and Troland during their war investigation of lie detector tests for the National Research Council. Larson, however, placed more stress on the breathing symptoms of deception and the correlation of respiratory irregularities with variations in the blood pressure. He agreed essentially with Marston as to the reliability of the blood pressure test for deception if properly administered under controlled conditions by an experienced operator with suitable scientific training, and Larson made notable contributions to test technique and apparatus. Using standard laboratory equipment in his initial researches, he later constructed a combined blood pressure and respiration recording instrument of polygraph type easily carried by hand to the scene of criminal investigation. This instrument, or similar ap-

paratus, has since been employed by most of the operators using the lie detection test.

Leonarde Keeler, who received his first training in this field from Larson, made an assemblage of blood-pressure and respiration-recording apparatus similar to Larson's, and after a great deal of applied work with the test directed the manufacture of this assemblage of apparatus in convenient form for police use and other applications of the test under the name of "Keeler Polygraph." Some seventy of these instruments are now in use by law enforcement officers throughout the country. Keeler later added a recording psycho-galvanometer attachment to this instrument; though he agrees with other investigators that the galvanometer criteria are less reliable than blood pressure (checked by respiration) in diagnosing deception.

With regard to the interpretation of blood pressure symptoms, many investigators content themselves with a somewhat vague description of the emotions accompanying deception. These they describe as "emotional tensions" or "emotional disturbances." Some operators conclude that blood pressure variations are caused by "fear," or "fear of detection," though fear has been shown conclusively to result in a *drop* of blood pressure level. Marston, who proposed a theory of psycho-neurologically described primary emotions (dominance, compliance, submission and inducement) maintains that the only reliable blood pressure criteria of deception are those which reveal the aggressive emotions of *dominance* and *inducement* accompanying the attempt to deceive. It is his contention that errors in the interpretation of test records result in good part from confusion between fear type response symptoms, which may be caused by any number of irrelevant factors in the total stimulus situation, and the dominantly defensive behavior criteria above cited which can be definitely related to the deception attempt itself.

III. PRACTICAL APPLICATIONS OF TEST PROCEDURES

1. *Respiration Test.* So far as can be ascertained, the respiration test for deception has never been applied in actual practice except as a supplement to the blood-pressure technique.

2. *The Word Association Reaction-Time Test.* The word association-reaction time test was applied originally by Jung in several private cases. Its use in the United States has been limited almost entirely to laboratory experiments and class-room demonstrations. Though private investigators have informed the writer that this test is occasionally useful in criminal cases, no records are available.

3. *Psycho-galvanic Test.* The psycho-galvanic test was applied by Father Summers in two New York criminal cases where test results were offered as evidence in court. In *People vs. Kenny* (167 misc. 51, 3 N. Y. Supp. 2nd 348 (1938)) the trial court admitted Summers' results obtained by testing the defendant with a galvanometer which he called a "Pathometer." Over the prosecutor's objection, the jury was permitted to consider the deception expert's opinion as to the defendant's innocence or guilt. Dr. Summers testified that the "Pathometer" was "effectively 100 per cent efficient." In a subsequent case, however, *People vs. Forte* (167 Misc. 868, 4 N. Y. Supp. 2nd 913; 279 N. Y. 204, 18 NE 2nd 31 (1938)) where Dr. Summers again attempted to introduce psycho-galvanometer test results in evidence, the trial court ruled against him and the New York Court of Appeals sustained the lower court's ruling. It should be noted that this decision does not exclude the blood pressure-breathing test in New York, since the latter test was not offered in evidence.

Father Summers' applied as well as his laboratory researches have been continued by Dr. Joseph K. Kubis, Associate Prof. Psy., Grad. School, Fordham University. Kubis states that he has been consulted by city and state police authorities; by the Armed Forces on problems concerning deception detection; has instructed the Director of the Scientific Laboratories (N. Y. State) in the use of his method; and that the White Plains, N. Y., D. A.'s office has used it with success (*Electronic Detection of Deception*, Electronics, 1945, Apr., 192.); also on medical patients to test whether they did or did not believe their delusional states (*Psychogalvanometric Investigations in Psychoses*, by Kubis and associates, *Psychosomatic Medicine*, VI, No. 3, 237).

Aside from Summers and Kubis' work, it would seem that the galvanometer has been used by practical investigators largely as an

adjunct of the polygraph type apparatus, testing blood pressure and respiration.

4. *Blood-Pressure Test.* The blood-pressure test for deception, with or without the breathing test, has been applied to a very considerable number of uses.

In 1917 Marston, Troland, and Burratt examined defendants in twenty cases in the Boston Municipal Criminal Court, using primarily the systolic blood pressure test, supplemented by respiration, reaction-time and galvanometer tests. So far as findings could be verified, all judgments of truth or deception based upon blood pressure criteria were correct. The investigators concluded: (1) that the blood pressure test has demonstrable practical value in determining truth or deception of a witness' story; (2) that confessions occur under conditions of this test which it had been previously impossible to extract; and (3) that by detecting guilty emotions accompanying hitherto unsuspected portions of a witness' testimony, new and fruitful channels of police investigation are opened.

These conclusions were later supported and verified by the findings of all subsequent workers in the applied field.

In 1918 Marston administered blood pressure tests to 70 messengers at Surgeon General's Headquarters, Washington, D. C., for the purpose of discovering the thief of important missing objects. All subjects were negroes of emotional temperament and blood pressure variations in all tests were great. But the thief was successfully detected.

Also in 1918 Marston, then a Lieutenant in the Army, taught blood pressure test technique to fourteen soldier operators, all with previous legal and psychological training. The operators tested suspects who had opportunity to steal articles from the barracks and made 74.3 per cent correct judgments. The b. p. test records were then turned over to Marston who made 97.1 per cent correct judgments. Marston concluded that the blood pressure test is reliable only if judgments are made by a thoroughly qualified operator with sufficient training and experience.

In 1922 W. M. Marston, LL.B., Ph.D., administered the blood-pressure test to James A. Frye, a negro accused of first degree murder in Washington, D. C. Marston tested Frye in the prison hospital while waiting trial. The test showed that Frye was innocent. At Frye's trial, defense

attorneys offered Marston as an expert in lie detection to give his opinion as to the truth of Frye's testimony based on test results. Chief Justice McCoy of the District Supreme Court excluded the proffered testimony on the ground that the test, to be admissible, should have been made in Court while the defendant testified. "If so offered," the Judge said, "this test might be admitted in evidence." Following this court's dictum, the blood pressure test was administered in 1924 to defendants accused of assault and battery in Indianapolis City Court by Edward F. New, an attorney associated with Marston in blood pressure test work. Test results were admitted in evidence and the findings of the court were in accord with the results of the tests. This was the first time a deception test had ever been admitted as evidence by any court in America.

Meanwhile, in 1921, John A. Larson, Ph.D., M.D., had begun to apply the blood pressure test in police investigations at Berkeley, California. Larson was extraordinarily well qualified for this work by training and experience—he received practical police training under Chief Vollmer at Berkeley, and during his university studies specialized in physiology, endocrinology, and later in psychiatry. Dr. Larson first applied the blood pressure-breathing test in a case of suspected thievery in a girls' dormitory at the University of California. Ninety girls were tested and the thief was discovered. While in California Larson tested 861 persons in 328 criminal cases, many of them cases of murder and other major crimes. As a result of test procedure, 182 suspects confessed, leading Larson and police associates to advocate substitution of the deception test for the "third degree." Three hundred and ten persons were cleared of suspicion by the test. Larson's results, so far as could be checked by evidence and court findings, showed a high percentage of reliability. A supplementary report on 193 subsequent cases at Berkeley, 1934–1936, not yet published, shows that Larson's tests produced confessions in 66 cases out of 92 judged guilty. Hundreds more criminal cases were later tested successfully by Larson while Assistant State Criminologist in Illinois. Prisoners were tested at the State Penitentiary and State Reformatory and suspects examined in connection with police and prosecuting attorneys' investigations. Still later Larson tested many cases as a psychi-

atrist in Recorder's Court, Detroit, with effective findings. Larson's pioneer work proved the practicability of applying scientifically administered deception tests successfully to criminal investigations.

Leonarde Keeler, A.B., LL.D., studied deception test technique under Larson and Vollmer at Berkeley, California, in 1921. In 1923 Keeler applied the blood pressure-breathing test to cases in the Los Angeles Police Department, using apparatus of polygraph type similar to Larson's, which Keeler constructed. Later, as a member of the Illinois State Criminologist's Staff, and as Professor at Northwestern University, in charge of the Scientific Crime Detection Laboratory, Chicago, Keeler used the test in a large number of criminal investigations in various states of the Middle West. He and his assistants also have tested thousands of personnel cases for banks and commercial employers. Keeler's testimony and the b. p.-breathing test records upon which it was based were admitted in evidence by stipulation between prosecution and defense counsel in the Wisconsin case of *State vs. Laniello and Gugnano* (see *Journ. Crim. Law and Criminology*, Vol. 26, No. 2, July, 1935). Findings of the jury were in accord with Keeler's test judgments and all jurors reported to the Judge that the tests were of considerable help in determining the credibility of defendants and of witnesses who contradicted the defendants' testimony. This is the first instance of admission of test results in evidence where the test itself was made outside court, a psychologically preferable procedure to that required by Judge McCoy's dictum and followed in cases above discussed. Keeler, now in private practice in Chicago, has tested numerous cases for the Army and Navy during World War II, and at its conclusion screened 270 prisoners of war chosen to be trained as police officers and returned to Germany to assist United States occupational forces.

George W. Haney, formerly associated with Larson and now a personnel consultant in Chicago has used the b. p.-breathing test, which he refers to as the Polygraph detection of deception technique, in servicing many businesses where honesty of employees is an important factor. His clients include banks, currency exchanges, mercantile houses, transportation (bus) companies, trucking companies, vending machine companies, warehouses, and armored car

services. Actual statements of employees, according to Haney, show that 40 to 60 per cent of them working with money or merchandise steal sometime during the course of their employment. Haney also states that 97 per cent of people on the street have taken something of value during their lifetimes.

From 1925 to date Marston, a consulting psychologist, has applied the blood pressure-breathing test technique to several hundred cases of marital adjustment, divorce, personality analysis, family conflicts, social and pre-marital adjustments; and such problems as applications for pardon, surety company investigations and lawyers' investigations of clients and witnesses. Associated with Marston in test work are E. H. Marston (lawyer, psychologist); O. B. Richard (psychologist); and C. D. King (psychologist).

Applied test work has been done by the following who originally worked with Larson:

Canty (psychologist, Ass't Director Psychopathic Clinic, Detroit Recorder's Court; Instructor Police Science, Wayne Univ.);
 Broom (lawyer and former head of Detroit Police Training School);
 Lyon (Juvenile Court psychologist, lecturer Criminology, Univ. of Illinois Medical School);
 C. D. Lee (Berkeley Police Department Captain, manufacturer of "Psychograph" instrument similar to Larson's and Marston's apparatus);
 O. W. Wilson (Prof. Police Science, Univ. of California);
 Greening (former Chief Police, Berkeley, Calif.);
 Waterbury and J. Wilson (former Police Inspectors, Berkeley, Calif.);
 Bledsoe (Berkeley Police Technician);
 Leonard (Prof. Police Science, Pullman State College, Wash.);
 Gabrielson (Chief Police, Honolulu);
 Elliot Ness (former Commissioner Pub. Safety, Cleveland, Ohio);
 Dean (formerly Berkeley Police Dept., now Brig. Gen. U.S.A.);
 Barton (lawyer, former Inspector Detroit Police);
 Lacey (Crime Detection Lab., Houston, Texas, former Lee operator);
 Kookan (Capt. Indiana State Police);
 Borkenstein (Technician, State Police Lab., Indianapolis);

Vaughn (Professor Psychology, Arizona Univ.);
 Selling (Psychiatrist, Detroit);
 Darrow, Ph.D. (Inst. Juvenile Research, Chicago, originator of Darrow Photo-Polygraph);
 Keeler (formerly Larson's student, Berkeley Police Dept.).

Also by men associated with Keeler: Inbau (lawyer), Mulbar (Michigan State police), Jaycox (Wichita, Kansas, Chief of Police), Trouvillo (Chicago City Police), Funk (Penna. State Police), Wm. D. Jack, M.D. (medical consultant), and Smith, Schrieber and Beecher (examiners).

And, carrying on Father Summers' work: Joseph F. Kubis, Ph.D. (Fordham University).

Many other able workers have applied and are applying this test effectively in the various fields whose pioneers are discussed above.

IV. STATUS AND EVALUATION OF TEST PROCEDURES

The association reaction-time test for deception, proved unreliable by laboratory research, is not in practical use.

Psycho-galvanometer records are taken by some operators in conjunction with the blood pressure and respiration tests.

Scientific opinion among psychologists with regard to the dependability of the blood pressure-breathing test for deception was at first divided. In 1926 a questionnaire prepared by Charles T. McCormick was sent to 88 members of the American Psy. Ass'n. Thirty-eight replies were received from psychologists whose work concerned this field. Eighteen believed the deception test was sufficiently accurate to warrant consideration by judges; 13 were of contrary opinion; and 7 gave answers of doubtful classification. (See 15 Calif. Law Review 484).

During the twenty years of lie-detection test development and application which have followed McCormick's survey, psychological opinion has swung more definitely toward the conclusion that this procedure is sufficiently reliable for practical use in criminal and personnel investigations and probably in court if the tests are made under proper conditions and results are used with sufficient safeguards. Among 55 opinions of psychologists obtained recently by the writer, 42 approve applied use of the test with proper safeguards; 5 believe the test is not yet dependable; and 8 endorse use of the

test for certain specified purposes and not for others.

The legal status of the test differs in different jurisdictions. In the *Frye Case*, above cited, lie-detection test evidence was excluded by the trial court and this decision was upheld by the appellate court (*Frye vs. U. S.*—293 Feb. 1913). But this was in 1923 and the Court's dicta suggested that the b. p. test might become admissible if made in court and if and when it gained sufficient "scientific recognition among physiological and psychological authorities." Whether this time has yet arrived could only be determined by bringing another test case in the District of Columbia Courts. In 1933 the Supreme Court of Wisconsin sustained a trial court's refusal to permit a defendant charged with robbery to take a deception test and put the results in evidence (*State vs. Bohner*, 210 Wis. 65). This court also remarked that the polygraph test "may ultimately be of great value in the administration of justice," but "a too hasty acceptance of it during this stage of its development may bring complications and abuses." Since a Wisconsin trial court subsequently (1935) admitted polygraph test evidence, in *State vs. Loniello and Grignano* above cited, it would appear that the *Bohner* case decision, while denying the right of a criminal defendant to demand admission of deception test evidence if the trial court chooses to reject it, does not bind the courts of Wisconsin to reject such evidence when offered by stipulation of both parties. Rejection or acceptance of the test, therefore, would appear to depend, in Wisconsin, upon the form in which such evidence is offered and upon the discretion of the trial court.

In several other states where the test has been accepted in evidence by lower courts, the law would seem similar to that of Wisconsin. No appeals from trial court decisions admitting the test in these states have so far been recorded.

B. p.-breathing test evidence has been admitted in trial courts in Indiana, Illinois, Ohio, Michigan and Wisconsin; possibly also in other states according to cases reported in newspapers but not otherwise verified. So far as ascertainable, no Appellate Court decision at the present time rules out b. p.-breathing test evidence if offered in a form approved by the trial court. On the other hand, courts everywhere are inclined to be extremely cautious about admitting

this type of evidence for two reasons: first, competent test operators themselves emphasize the fact that there is a margin of possible error in test judgments; second, because it is feared that general acceptance of deception-test evidence in court may open the door both to insufficiently qualified test operators and also to fraudulent and dishonest persons ready to fake any findings for which they are paid. The writer agrees with the general attitude of American courts requiring every precaution in admitting deception-test evidence to guard against these two causes of possible injustice.

With regard to the margin of error which may be expected in the results of tests made by expert operators, the opinions of examiners differ. Larson, whose own results have proved remarkably accurate and reliable, states that the test if given by inadequately trained operators without the aid of supplementary data furnished by medical and psychiatric examinations may show an error as great as 50 per cent. "Neither medical nor criminological training alone is sufficient," says Larson, "but a staff consisting of the investigators, the examiner ideally with psychological training, and a psychologist and licensed physician or a forensic psychiatrist. The last three named should be present throughout every examination. Conducted by a suitably trained staff—deception tests may be invaluable in service, first in the primary investigation as an adjunct to the present methods of cross-examination, and, secondly, in court clinics and private laboratories as a part of psychiatric technique."

Keeler states: "In personnel cases for banks and department stores, the results of which are of immense importance to the business, approximately 80 per cent of those giving test results indicating deception have made confessions later verified, or have otherwise been definitely proved guilty. In criminal cases approximately 62 per cent of those giving test results indicating guilt have made verified confessions or otherwise been proved guilty. In approximately 10 per cent of the cases the test results are of such nature that no definite diagnosis can be made. In slightly over one per cent of the cases, the wrong diagnosis has been made."

Inbau writes: "... there is a margin of probable error of approximately 10 per cent. There is also an additional group of cases, approximately 20 per cent, in which test rec-

ords are too indefinite in their indications to permit diagnosis."

Marston agrees with Larson that inadequately trained operators may show a high margin of error in judging test results. He agrees also with the authorities quoted that from 10 to 20 per cent of all records made may furnish inadequate data for reliable judgments of truth or deception. This, however, should not be regarded statistically as a failure or inadequacy of the test, since further records can easily be made and always are made by expert and competent operators. This correction applies also to the margin of error to be expected in all records made even by expert operators—the records can be and should be verified by additional tests whenever the slightest obscurity appears in the results obtained. Keeler advocates making two records of every person tested and reports that the second record shows greater symptoms of deception than the first if the subject is attempting to deceive. If all the precautions above discussed are taken by an expert and adequately trained operator, Marston finds that the margin of probable error is considerably less than 10 per cent; in his own cases, so far as results can be verified, the error is approximately 5 per cent. This applies to all types of b. p.-breathing test applications above described which seems to make the tests, in the writer's judgment, sufficiently reliable for practical use, including use in court when employed with sufficient legal precautions and psychological controls.

There is one aspect of the reliability of deception test results which has been ignored by the courts and seldom considered by deception test proponents; namely, the comparison between the accuracy of deception test findings and the findings of fact by the average jury. Marston made a study of juries' reliability in Washington, D. C. (Journ. of Crim. Law and Criminology, Vol. XV, No. 1, May, 1924) and found that the average completeness of six juries' findings of fact was 35.9 per cent while the accuracy of conclusions drawn from this small percentage of facts was approximately 59 per cent for a male jury and 71.4 per cent for a female jury based on witnesses' testimony during direct examination. On cross-examination testimony the female jury's accuracy was 71 per cent and the male jury's accuracy 68 per cent. Combining the scores of accuracy and

completeness, the findings of the average jury could be rated no higher than 52 per cent reliable. Subsequent analysis of juries' findings, so far as they could be checked in the cases of 4,800 prisoners in the Texas Penitentiary and 438 other cases in various parts of the country studied by Marston, indicated that juries' unaided judgments of the truth or deception of testimony can be valued at little better than 50 per cent. Many defendants are convicted because they try futilely to conceal private affairs of no importance to the question of their guilt or innocence. The jury, with no adequate criterion by which to form a judgment on the important portions of defendant's testimony, frequently considers his story entirely false because of an irrelevant deception. The result in such cases is a wrongful conviction based upon the jury's unaided judgment of the veracity of testimony. Comparison of the reliability of the average jury's unaided judgment of the truth or deception of testimony with the reliability of blood pressure-breathing test results obtained by a properly qualified expert shows a 30 to 40 per cent greater reliability of test judgments. Perfect justice can never be attained by any human procedure; but there seems little doubt that a much higher degree of justice already has been achieved in many hundreds of cases by b. p.-breathing test technique than would otherwise have been possible.

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LOBOTOMY.—The operation of bilateral prefrontal lobotomy, to give it its full name, should be of very special interest to psychologists for three reasons. They are naturally interested in mental hygiene, and this development promises much in the way of relief of psychotic symptoms. Secondly the post-operational changes that take place in mentality may throw much needed light on the localization of brain functions and other theories of neural activity. In the third place, psychologists have a

direct professional interest in the matter. Their cooperation with the neuropsychiatrist and neurosurgeon is usually sought and appreciated, since it has been proved that they can assist materially, not only in the selection of cases but also in the prediction of the mental consequences and in determining the surgical adequacy of the operation. Thus the status of the psychologist *vis-a-vis* the psychiatrist will be measurably improved, a result professionally very desirable from the standpoint of both professions.

Prefrontal lobotomy consists in cutting an estimated 80 to 85 per cent of the subcortical connections of the frontal areas with the rest of the central nervous system, leaving the overlying cortex practically intact. Specifically, the neural pathways that are chiefly disrupted are those running between the thalamus and the frontal lobes, in other terms the thalamo-frontal radiation. The cells of the cortex anterior to the incision suffer little or no deterioration, but those of the nucleus medialis dorsalis of the thalamus show severe retrogression.

The operation was first performed in 1935 by Egas Moniz, a Portuguese neurosurgeon, for the relief of psychotic symptoms in certain types of mental patients. By means of a specially devised instrument operating through a trephine hole in the upper temporal region, Moniz cut spherical cores in the white matter, leaving them in position to be absorbed or encysted. When this operation was ineffective, minute quantities of alcohol were injected at different depths between the cores forming a "prefrontal barrier." Patients suffering from agitated depressions were most affected by this "psychosurgery," schizophrenics less so. Out of 20 cases, 7 recovered and 7 were improved.

The operation was introduced to America in 1936 by Freeman and Watts, (3) but they soon discarded the Moniz technique for deep, straight line incisions along the plane of the coronal suture, taking care to stop short of the cortical layer of grey matter. By a series of radial cuts, they endeavored to sever as much of the subcortical connections as possible. If the arc of the fan shaped incision is not deep enough or if the plane of the cut is too anterior, mental changes are not apparent. If the cut is too deep or too posterior, the results may be too severe, the patient relapsing into a somewhat vegetative

To ensure the surgical adequacy of the procedure, Freeman and Watts perform the operation under a local anesthetic and test its effects at the time by questioning the patient or getting him to count backwards, add, or recite the Lord's Prayer, etc. When the fourth and last quadrant is severed, disorientation, mental confusion, and relief from anxiety are at once apparent. However, this is imposing a very severe proof of the surgical adequacy of the operation. The psychologist's cooperation can, we believe, obviate the use of local anaesthesia, with the resultant strain on the patient's fortitude.

For a few days following the operation there are decided changes in behavior. For the first day or two there is mental confusion, so that Freeman and Watts remark: "This disorientation is so characteristic that it is used as a yard stick for satisfactory operation. While it does not always occur on the operating table, if it is not present on the first post-operative day, it is likely that the operation will be a failure and that the preoperative symptoms will return within a short time." (4) Peterson (9) however does not agree that mental confusion has this prognostic significance. Other typical reactions are incontinence, increased appetite, loss of initiative, regression to childish behavior, physical inertia, somnolence, and psychomotor retardation. In a few days these symptoms tend to disappear. For successful cases the depression and physical agitation are relaxed and general improvement follows, extending over a period as long as a year or more.

It is not within the province of this article to give anything more than the barest statistical summary of the results in terms of percentages cured or improved. A considerable literature is springing up on the subject reporting the types of cases operated upon and the observed effects. Besides Freeman and Watts, the most prolific contributors, Lysterly (7) reports work done at the Florida State Hospital. He states that 74 per cent of his 55 cases were moderately or greatly improved to the extent that they could leave the State Hospital, have returned to work or become socially adjusted. In 1943, out of 136 patients operated on between 1936 and 1942, Watts and Freeman reported good results in 98 cases or 72 per cent, and fair results in another 23 cases or 17 per cent. Thus some improvement was noted in 89 per cent of

These results are more favorable than those presented in other studies. Typical of these is Kisker's report on 20 cases operated on in Columbus State Hospital, Ohio. Six improved to the point of being released, while 4 others made a more satisfactory hospital adjustment, 7 remained unimproved, and 3 died. (6) Thus improvement resulted in 50 per cent of cases, causing Kisker to remark: "Considering the extremely poor prognosis of the cases selected for operation, this figure is all the more remarkable." His cases are comparable with those operated on by Dr. Ralph Cloward at Kaneohe Hospital, in Hawaii, and reported upon by Porteus and Kepner (12). They found that 11 out of 20 patients or 55 per cent showed some improvement. This group, too, included a proportion of cases with extremely unfavorable prognoses. Latterly, with a better system of selecting patients, the proportion of successes has increased materially. Incidentally the "batting average" of the psychologists in predicting correctly the outcome of the psychosurgery is about 85 to 90 per cent. Petersen and Buchstein (10) observed decided improvement in 16 of their 29 cases and a lesser degree of success in another 11 cases.

Schrader and Robinson (13) have reported results on one of the largest groups of lobotomy cases (207), with good results in 52 per cent of cases, fair improvement in another 19 per cent. They summarize results of 13 studies involving 601 patients. Of these, 47 per cent improved markedly and 24 per cent made moderate progress. The mortality was 5 per cent. Undoubtedly careful selection of cases will improve the record of successes very materially.

On the basis of this now extensive experience, the consensus of opinion seems to lean heavily in favor of this new surgical procedure, though caution is recommended by most investigators. The cases most suitable for operation seem to be those suffering from obsessive tension states. Some patients exhibiting chronic agitated depression have made most remarkable recoveries. One of the most striking of these that came within the writer's observation was that of a woman 64 years of age who had spent 27 years in mental hospitals and was, prior to operation, so cantankerous or depressed as to be unapproachable. Now, two years subsequent to lobotomy, she has developed into an easily manage-

able, intelligent and interesting old lady, somewhat crotchety at times but on the whole sane and reasonable. Some cases, chiefly schizophrenics, show disappointing effects, while in others the changes seem most remarkable and even miraculous.

We come now to the extremely interesting question of the neurological basis of the mental changes and more specifically the light thrown on the functions of the prefrontal areas of the frontal lobes. Moniz held the theory that the operation benefitted the patient by freeing his personality from such dominating ideas as chronic anxiety, delusions of persecution, hypochondriacal or grandiose ideas. Neurologically speaking, he held that the fixed synaptic patterns that mediate personality are disrupted and new circuits of response are set up of a more satisfactory social nature. This viewpoint seems to find support as regards emotional components from Kisker, who says that "one basic factor in postlobotomy personality status is the recanalization of emotional energy. . . . The disorganization occasioned by the destruction of the anterior thalamic radiation permits new lines of identification which, when properly canalized, result in a personality more highly integrated with the world of object reality."

The theory of recanalization agrees with hypotheses put forth at various times by the writer. These may be very briefly stated.

All responses are circular and to some degree repetitive. A simple example is provided by Allport (1) of an infant saying the syllable "Da." The auditory pathways are stimulated and the excitation radiates to the centers for speech, which under the principle of neurobitaxis are placed in close conjunction. Thus a neural circuit is completed which later becomes part of a wider circuit which involves conscious imitation of a similar sound repeated by the mother, and still later is associated with a still wider neural circuit involving the image of the father, with whom the sound is associated. The writer has insisted that all purposeful responses have this characteristic of circularity. (11)

Those stimuli to which it is advantageous for the organism to respond are termed relevant, the most relevant being those that involve the widest neural circuits, or in other terms, the most massive response. Naturally, those that have an emotional reference are the most relevant since they involve the whole organism.

The mechanical principle in setting up a circuit of response is the contraction under stimulus of nerve cells which is communicated to nerve processes, bringing about synaptic contact in the same way as a tangled skein is tightened by tugging at the free ends.

Those stimuli for which there is already a prepared path are instinctive, and closed circuits are also characteristic of activities which have become automatic. In other situations where choice of reaction is possible, some arcs of the circuit are not complete, and in such problems of adaptation there must be a mental rehearsal of action, an anticipatory excitation of certain neural pathways, a mental trial and error solution.

Personality, in the writer's opinion, can best be defined, following G. W. Allport's summary (2) in terms of the individual's "unique adjustments to his environment," his characteristic style of response. In the abnormal personality certain situations acquire a mistaken relevancy; the responses may become either over-emotionalized or over-intellectualized. If the former, the behavior is excitable or compulsive; if the latter, it may be hesitant, confused, consciously ineffectual. In either case, there is no proper integration or balance between the functions of the frontal lobes and the thalamus. The only way to achieve a better balance is to break up the existing synaptic patterns so as to admit of the formation of new personality trends. This the operation of prefrontal lobotomy effects.

More specifically, what is affected is apparently the mental rehearsal or pre-rehearsal, the anticipatory excitation which seems to be mediated by the prefrontal areas. The evidence for this seems fairly conclusive and is based not only on the observed ward behavior of post-lobotomy patients but also on the results of tests of planning and foresight.

That planning is adversely affected by lobotomy seems to be a common observation of investigators of the problem. One of the latest contributions on the subject is Freeman and Watts' (5) "Behavior and the Frontal Lobes," which supplements the reports contained in their book on Psychosurgery (3) and brings their experience up to date. In the writer's opinion this latest statement of Freeman and Watts has a greatly improved cogency and definiteness.

Foresight, they say, is badly impaired for a

period after operation, particularly in the matter of personal and interpersonal adjustments. In everyday affairs, or in the pursuit of a profession, especially where there is no marked emotional component, decisions may be hasty but adequate. In more intimate personal matters the decisions are likely to be over-hasty and deficient in foresight. As regards new or original adjustments, patients are likely to fail. "Creative work of any considerable complexity is a closed book for most patients." In these authors' opinion lobotomy cases lack, not only foresight, but the mental energy to carry their efforts forward to the goal. The presumption is that the main-spring of this energy comes from the thalamus. To use my own descriptive terms, I would say that the behavior, from being over-emotionalized, has become under-emotionalized. Freeman and Watts also emphasize their view that the frontal lobes "give the individual an image of himself as he is appearing from moment to moment." This inadequacy of personal reference I would express in another way by saying that the neural systemic circuits that underlie characteristic styles of response, or individually unique adjustments, having been disrupted, the patient has lost the rudder of consistency. He has no fixed conception as to how he should respond, no image of himself as he was. While the new personality is building it is not surprising that the patient relapses into childlike attitudes. "There is something childlike in the directness and ingenuousness of people after lobotomy," say Freeman and Watts. Some of these viewpoints are confirmed by Kisker, who also emphasizes the emotional intellectual balance that is therapeutically affected by lobotomy. "Considering," he says, "the widely held view that the cortex maintains an inhibitory function over the activity of the diencephalon, it is of interest to note that lobotomy is not ordinarily accompanied by chaotic emotional release. Rather, there appears to be a redistribution of emphasis in the emotional sphere."

Schrader and Robinson have noted in respect to schizophrenic patients who have undergone lobotomy that the average case "learns rather slowly and has little initiative when alone." Nichols and Hunt's case also showed a deficit in initiative essential to planning as was shown by "failure to supply spontaneously fresh modes of attack on a problem apparently resulting from an inability to abstract that aspect of the

situation causing the difficulty." They also note that the patient "seems to have lost the capacity to sustain several parallel lines of activity separately." (8)

Among the patients reported on by Porteus and Kepner, lack of initiative was a marked feature of post-operative behavior. Though ward work made few calls for planning capacity or foresight, whenever these were observable they were defective. The essence of deficiency in initiative, it should be observed, is a failure in voluntary planning. Incidentally, one may remark that the old saying that "Satan finds some evil still for idle hands to do" loses its force in the case of the lobotomized patient. Lacking the drive which the thalamus contributes to intellectual activities, the patient is content to carry out merely familiar tasks. It is worth emphasizing that it is voluntary planning which is lacking and ability to attack effectively new problems. Those skills or activities which were familiar to the patient are retained, and under direction or the spur of necessity may be carried on without apparent loss of efficiency, but he will not of his own volition attack new problems. The effective planner must be fertile in expedients, and the lobotomized individual is remarkably infertile in working out alternative solutions.

It is, however, in the testing situation that the deficiency in planning is best demonstrated. Generally speaking, there is no consistent loss of ability of the kind that is examined on the Binet scale unless it be in those situations where mental flexibility is most in demand, such, for example, as the application or interpretation of proverbs. The patient frequently will give the literal meaning of the proverb without being able to apply it to other situations. It is, however, in the Maze Test where deficits are most apparent.

In many cases the planning capacity of psychotic patients is already impaired, so that the average Maze score is relatively low, that of 44 patients prior to lobotomy being only 11.15 years, or about 3 years below the adult average score. In the first place, it should be remembered that ordinarily a reapplication of the Maze tests within a six months' period would result in the raising of the score through practice effects. Probably 80 per cent of normal individuals with Maze scores less than a perfect performance on the first trial improve on a sec-

ond application. What happens to the lobotomy cases?

In spite of an inferior initial performance, thus leaving ample room for improvement, these 44 cases scored 9.3 years in their post-lobotomy average, or 1.85 years below their former average of 11.15 years. In terms of I.Q. points the deficit is over 13 points. Instead of 80 per cent improving their score, the situation is reversed. About 73 per cent had scores lower than their prelobotomy performance, 4 per cent were unchanged, and only 23 per cent improved. Two individuals who increased their scores on the second application were both re-operated on, and in each case the third application of the maze showed the characteristic decline. The average I.Q. gain of the 10 patients who improved their scores was only 7.7 points. The only patient with a relatively large increment of 28 points committed suicide, and the autopsy showed that the operation had been inadequate. The interesting paradox is that unless the maze score declines on the second application the operation is usually surgically insufficient to bring about any marked remission of the psychotic symptoms. As far as the Hawaii experience goes, an improvement in post-operative score, taken in conjunction with absence of remission of the psychotic behavior, seems to be an indication for reoperation.

The average loss for 32 patients whose Maze scores decline was 18.6 points, and this very marked deficit would seem to support the clinical observation that initiative and voluntary planning capacity are grossly impaired. Nevertheless the gains through psychosurgery clearly outweigh the losses, provided that a careful selection of patients for lobotomy is made.

Certain criteria of selection are in process of validation. One seems to point to the exclusion of patients exhibiting hebephrenic features in their behavior. Apparently the emotional regression has proceeded too far in these cases for operation to benefit. On the same principle those who show marked intellectual regression are also unsuitable. It is, however, sometimes very difficult for the psychologist to measure deterioration, as so frequently the behavior masks the real mental status. A third criterion is rather obvious. Those of initially low mental level cannot be expected to benefit except as regards institution adjustment. To what extent brain surgery should be employed for the pur-

pose of quieting the patient and making him easier to manage is an ethical problem which must be left to the psychiatrists to decide.

As regards type of patients, it has yet to be proved that the diagnostic label has very much value in selection of cases. The agitated depressions, provided that there has not been too much mental impairment, and the compulsive tension states are the conditions that seem to respond most favorably. Paranoid conditions, especially when the delusions have a sex basis or marked sexual components, are less likely to be relieved, while auditory hallucinations do not seem to be eliminated. Schrader, on the basis of his experience, would exclude schizophrenics unless they are of the catatonic type.

However, it should be emphasized that the operation is very new and the results are not yet either wholly accessible or assessable. Hence the selective criteria are merely tentative, and in the meantime even hunches are sometimes successful. What is badly needed is a psychological institute for research on the effects of lobotomy. Only in this way can we be assured of systematic follow-up activities for the assessment of what promises to be the most promising development in the field of neuropsychiatry which has yet appeared.

What would be the result if all mankind were to undergo prefrontal lobotomy? The writer has already suggested that the effect might well be to reduce humanity to a dull level of mediocrity. In a personal communication, Dr. Schrader has put forward the interesting theory that patients with a prefrontal barrier occasioned by operation have many points in common with primitive peoples. There is a great deal of weight in this suggestion. In ethnic groups where government by the tribal elders is the rule, individual voluntary or creative planning is at a minimum. There is very little initiative possible, since tribal custom regulates very strictly all activities. The individual who steps out of the rut of custom meets with social disapproval, which has exceptional weight in conditions where a sense of "belonging," or tribal fellowship, is most necessary to individual happiness. (The savage, incidentally, is the world's greatest "joiner," cannibals having instituted the first luncheon club.)

In primitive life there are, therefore, few opportunities for individual self-expression. Thus

initiative, voluntary planning, creative originality are deficient. Prehistoric man with highly developed frontal areas would have been like a car with a powerful engine and a weak steering mechanism. The emotional life of savages, which is the dynamics of behavior, is not less than ours, but the range of goals on which to expend itself is limited. It becomes concentrated on what we consider insignificant objects. The great gap between an uncivilized and a civilized mind is that neither can understand the other's enthusiasms.

There is no doubt that some people's planning capacity has run ahead of their judgment and vision so that their emotions have become involved in the pursuit of foolish goals. It is unfortunate that the neurosurgeons were not able to get hold of Hitler a dozen years ago. Lobotomy might have been the most effective cure for Naziism. Whether all the world would be happier for being "mediocritized" as well as "democratized" is, however, an open question. The surgeons, given their way, have now apparently the means of making mankind into an unoriginal, unworrying, inexcitable, untroublesome mass. If Atlantic Charters and all else fails to bring lasting peace, we might call in the neurosurgeons.

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MATURITY, THE PSYCHOLOGY OF.

—Interest in the psychological aspects of aging goes back at least several thousand years; however, it is only within the last few decades that comparative studies of adult age groups have put such interest on a scientific basis. Young human adults have been exhaustively scrutinized since the very inception of psychological science, but older individuals have failed to arouse curiosity on an equal scale.

A few scattered papers on later maturity appeared during the first thirty years of the present century, and in 1923 G. Stanley Hall published a book on senescence which was intended as a companion volume to his earlier work on adolescence. The Stanford Later Maturity Research Project, conducted by Miles and his associates in the early thirties, was the first systematic attempt to investigate the subject. A number of important inquiries on old age have recently been reported by other workers and the volume of publication in this field is gaining rapidly, spurred on by an impending vast increase in the number of older persons. We are, therefore, in a position to sketch, in a preliminary sort of way, the psychology of maturity.

Although our knowledge of the adult years is still fragmentary and incomplete, the age trend with regard to most psychological traits and abilities seems unmistakable. In most functions, the course follows that of a parabolic curve, reaching a peak in early adulthood, with a slow decline through middle life, and a sharp drop during the senile stage. Changes are usually gradual and are often a long time in becoming manifest, in contrast to the rapid sequence of events during the developmental years.

Decline takes place early and with greatest certainty in those abilities which are based primarily upon bodily activities. Although many changes in psychological functioning have their source in the aging of the tissues, the relationship is not always of a one-to-one nature. This

may be attributed to the existence of compensatory mechanisms and physiological reserves.

The pattern of decline is not identical for all abilities or in all individuals and it is frequently the pattern rather than the specific losses which determines the extent of personal adjustment. Moreover, the social environment and the person's relationship to that environment decides whether a given deficiency is disabling or of little practical consequence.

A. SENSATION AND PERCEPTION

Decrement with age in such sensory functions as vision and audition is well established. Although there are significant individual differences in the rate of loss for each of these processes, the trend is the same for all persons. For example, Miles (1933) reports that none of the men in his 70-89 age group had visual acuity equal to that of the average of his 18-29 subjects.

Beyond the fourth decade there is a gradual reduction in visual acuity, a slowing of dark adaptation, a narrowing of the visual field, and a rising threshold for light stimulation. Decrease in the elasticity of the lens begins in childhood, and it is almost totally gone before the age of 60; impaired accommodation is associated with the loss in lens elasticity. The narrowing of the visual field has been attributed to nerve cell degeneration. The incidence of visual pathology increases with each succeeding decade.

Losses in hearing are gradual, appearing first with reference to the higher tones. In general, the higher the pitch of the tone, the more rapid is the loss. Stevens and Davis (1938) report very slight hearing losses for all ages up to 60 for sounds no higher than 512 cycles, and that hearing is within 10 decibels of normal for a pitch of 1024 cycles. However, at frequencies above 2000 the loss at advanced ages becomes very marked. Montgomery (1940) has found that at the higher frequencies the decline is less for women than for men, while

at the lower frequencies the decline is greater for women.

Summarizing the findings regarding hearing decline, Miles (1943) points out that at 8192 cycles the age curve from 20 to 60 years is parabolic, the median loss reaching 40 decibels. Decrement is evident at 1024 and 2048 cycles at age 40. At 50 there is slight impairment in the higher middle ranges, with a sharper loss evident at 60.

Other sense organs also undergo changes in middle and later maturity. Pearson (1928) has found an increasing number of people exhibiting absence of vibratory sensibility in each decade beyond the third. Critchley (1931) reports a decreased sensitivity to internal pains among older persons. A marked decline in the number of taste buds during the senescent period has been observed by Arey (1935). Roughening of the skin contributes to decreased tactile sensitivity of the elderly. Presumably, changes take place in all of the sense organs of the body.

Sensation antedates perception and is essential to it. Accordingly, in view of the sensory changes which have been described, it is not surprising that perceptual processes are affected. Perception also depends upon cortical elements and these elements age along with other tissues. Experimental results indicate that both the speed and the span of perception are adversely influenced by the process of aging.

Typical of the findings on perception are the results reported by Price (1931). Using a Weaver tachistoscope, he examined subjects ranging in age from 6 to 89. He presented six varieties of material, allowing a standard exposure of 0.1 of a second; the materials used included short sentences, colors, letters, groups of lines, erroneously written common expressions, and numbers. Glasses were permitted. Score was determined by the number of items correctly perceived. There were small age differences in performance between 12 and 49, with decline becoming evident after the age of 30 and fairly marked after the age of 50. Individuals of 74 did about as well as children of 8 or 9.

B. MOTOR ABILITIES

Using a group ranging in age from 8 to 80, Miles (1931) studied the fate of such hand movements as reaching and grasping, digital

flexion and extension, and rotation of both dominant and subordinate hands. His results indicated rapid improvement in coordination ability from 8 to 18, followed by only a very gradual slowing down until about age 50, after which the decline was more pronounced, but still small. Individual differences were conspicuous at advanced ages.

Miles (1931) also investigated hand pursuit reaction accuracy and simple reaction speed by the hand and foot to an auditory stimulus. The digital and foot reactions remained fairly constant until the age of 50, after which decline began to appear. It appeared sooner in the foot reaction than in the digital one. Pursuit movement speed increased up to age 18, a plateau was maintained until about 30, beyond which the decline was fairly sharp.

Ability to keep a car on a straight course (eye-hand coordination) and speed in raising the foot from the gas pedal and depressing the brake have been studied by DeSilva (1936). Basing his conclusions on a sample of 2000 cases between 15 and 65 years of age, DeSilva found that reaction time reached a peak at 23, with a steady decline thereafter. The difference in reaction time between ages 23 and 65 was .06 seconds, which means that a car driven by the older man would travel an additional 5 feet before being halted, assuming its speed to be 50 miles per hour. Steering control reaches a peak at age 19, with a steady drop thereafter. In spite of the changes in eye-hand coordination and reaction time, the older driver is less likely to be involved in accidents than a driver of the youngest group, because he is more safety-minded, drives more slowly, less frequently and under less hazardous conditions.

Administering the Link McFarlane Cube Assembly Test, which measures intelligence, construction dexterity and perception, Miles (1935) found a gradual reduction in speed from the twenties to the sixties, with a more precipitous drop thereafter. He recruited as subjects a representative group of adults ranging in age from 20 to 90. Significantly, older men with mechanical experience achieved the young adult speed rate and were definitely superior, in the 50-69 age group, to men without mechanical training who had equal intelligence and formal schooling.

The McFarlane Coat Assembly Test has also been given by Miles (1935) to a representative

age sample with similar results in the matter of age-speed decrement. However, women did markedly better on the test than men, as evidenced by the fact that the average 70-year-old woman was better than the average 20-year-old man. Here again, experience plays a very important role in performance.

C. LEARNING AND MEMORY

Learning and memory are inseparable, being aspects of a common process. Although the products of learning may persist even after the ability to learn has been greatly impaired, learning must take place before memory is possible. On the other hand, the nature of a person's apperceptive mass is a factor in determining the ease with which he may assimilate new material.

Thorndike, Bregman, Tilton and Woodyard (1928) found only a slight drop in learning ability from a peak between 22 and 23 up to age 45, after which the rate of loss was more pronounced. Tasks which sample "basic modifiability," such as drawing lines of specified length while blindfolded, learning a letter code, associating numbers with nonsense syllables, and learning to write with the non-preferred hand, showed the largest amount of age-decrement. There was almost no loss in elementary-school subjects, and university work was mastered with approximately equal facility by both the younger and older age groups. On the basis of their findings, Thorndike and his associates estimate an overall deterioration of about 15 per cent in learning efficiency between the ages of 22 and 45. They also point out that losses in learning ability may be compensated for by more thorough methods of work and greater effort.

Evidence has been gathered by Sorenson (1933) which indicates that persons over 60 exhibit no reduction in their ability to comprehend the meaning of standard test paragraphs, when such persons are compared with younger ones of the same educational and occupational levels. As a matter of fact, the oldsters were even superior in vocabulary ability. Sorenson has also been able to show that lack of practice in learning is unfavorable to the retention of learning ability.

The status of motor and verbal learning at various ages has been investigated by Ruch (1934). One of the motor skills involved sim-

ple eye-hand coordination and the other was identical except that the subject observed his behavior by means of a mirror. The verbal tasks included the learning of false multiplications, a series of nonsense equations, and a series of logical associations. The subjects were divided into three age groups: 12-17, 34-59, and 60-82. The 60-82 group did more poorly on all tasks than the middle-aged group. Impairment was greatest in the acquisition of nonsense material and mirror learning and least for direct-vision learning and paired associates. Ruch concluded that learning loss is greatest where there is conflict with established habit patterns. The scores of the 34-59 group were superior on some tests to those made by the youngest group and inferior on others.

Memory is the keystone of most, if not all, of the higher mental processes. Changes in memory usually are accompanied by modifications in thinking, imagination, learning and other processes. From the standpoint of mental functioning, the amount of material lost is often subordinate in importance to the type of material lost. The degree of integration existing in the surviving material is also an important factor with regard to adjustment. Some of the methodological difficulties involved in the study of memory have been described recently by Jones and Kaplan (1945) in their appraisal of changes in senile psychotics.

Observation and recall as a function of age has been studied by Jones, Conrad and Horn (1928) with the aid of motion pictures. They constructed completion and multiple choice tests for three motion pictures, using a representative rural New England group. Marked decline began to appear about 45, with rectilinear decrease to the age of 60. At 55 the median had dropped to a level below that represented by the average 13-year-old.

Employing 11 different memory tests, Gilbert (1941) studied memory loss in a group ranging between 60 and 69 as compared with the performance of persons 20-29 years of age. The older group performed more poorly on all tests, the least discrepancy between the two groups being in visual memory span for digits and the greatest difference being in retention of a Turkish-English vocabulary list.

In summary, it should be emphasized that individual differences in learning and memory are marked at every age level. Moreover, the

pattern of change with regard to these functions is not identical for all persons; it has been demonstrated that persons with superior intelligence and education maintain their learning and memory abilities longer than others who have not been equally favored.

D. INTELLIGENCE

Intelligence, as it is defined in our various mental tests, is a composite made up of a number of special abilities. Tests differ in the emphasis placed upon speed versus power and in the relative weights assigned to such functions as vocabulary, arithmetical ability, memory, and general information. Accordingly, the results reported in the literature on the performance of adults vary with the test instrument used, the conditions under which it was administered and the type of subjects employed.

Mental capacity must be translated into ability by extensive training and constant repetition before it is measurable by our verbal intelligence tests; this must be given consideration in evaluating the scores of older persons not favored by education or occupation. An uneducated man of 60 or 70 may do poorly on a test in spite of high capacity and a desire to give a good account of himself. Until longitudinal studies giving attention to occupational and educational factors are undertaken, we shall not be in a position to assess accurately the intelligence of older persons.

Loss of ability does not always connote loss of capacity, although loss of capacity would be followed by loss of ability. Old people may have more ability along certain lines than young people of greater basic capacity.

Most studies have relied upon intelligence tests designed for children or young adults and the validity of their use with older persons has been questioned by Lorge (1945) and others. It has been suggested that many test items which are passed by youngsters on the basis of thinking are solved by older adults on the basis of memory or by mental processes different from those employed by children. Moreover, the criteria which may be adequate for testing the mental ability of school children and young adults may not be fair standards for persons of advanced age who are far removed in time from their academic experiences and attitudes. Some have argued that the weights assigned to the different types of test items

should vary with the several age groups. The development of norms of test performance for the older age groups is a step in the right direction; this has been done for the Wechsler-Bellevue Intelligence Scale. However, the development of norms for adults does not dispose of the objections which have been raised with regard to test content.

Motivational factors have not always been comparable in the various published studies. In some instances, subjects were paid for their participation in the investigation. In others, they were tested on a voluntary, non-remunerative basis. In still others, the subjects were examined under conditions of maximum effort and with a goal of some kind clearly in view. A further difficulty arises from the fact that although an older person may be highly motivated, he is far removed in experience from the school situations which foster competition. The greater lability of the young may play an important role in their somewhat superior test performance, although it does not fully explain their higher average scores. Unfortunately, there are few published studies on the performance of older persons under conditions of intense motivation.

Accurate sampling of the older elements in our population is complicated by the reluctance of many aged persons to be tested. Jones and Conrad (1933) have shown that less competent persons in older age groups frequently attempt to evade examinations, thus raising the average scores. This has been confirmed by Thorndike and Gallup (1944) who used a vocabulary test of a steeply graded type in a national survey.

The three most widely publicized studies of mental ability during the period of maturity have been published by Miles and Miles (1932), Jones and Conrad (1933), and Wechsler (1943). All three studies are in substantial agreement in indicating rapid gains during adolescence, with a peak in the vicinity of 20 years, followed almost immediately by a gradual decline. Jones and Kaplan (1945) have drawn smoothed age curves based on the data of these three investigations, showing that Wechsler, and Miles and Miles found more rapid decline than Jones and Conrad.

Miles and Miles (1932) found that the correlation between score and age during the period 20-95 years is approximately $-.50 \pm$

.02 and the discrepancy between the mean scores in the third and ninth decades is 9.9 S.D. diff. Using a population of 2000 which she considered representative of various age periods and a short form of the Otis test, C. C. Miles (1935) found a decline in mental ability beginning in the twenties. The drop became fairly steep between 40 and 60, and very precipitous beyond 70. Describing data gathered in the standardization of the Wechsler-Bellevue Intelligence Scale, Wechsler (1943) reports finding that intellectual ability reaches a maximum between 20 and 25, and begins to drop immediately thereafter, although decline is not marked until much later. At age 60, mental ability stands at 75 per cent of the 25-year-old level.

Since intelligence is not a unitary function, it is not surprising to find that the items which make up our tests do not decline at the same rates. Investigators agree that vocabulary and general information hold up better with age than items based on memory ability or logical thinking.

Utilizing data gathered by Jones and Conrad (1933), Jones and Kaplan (1945) found greatest loss in the Army Alpha subtests dealing with analogies and directions, and the least loss in vocabulary and general information. Wechsler (1939), evaluating data based upon the Wechsler-Bellevue Adult Intelligence Scale, has found that tests which hold up with age include object-assembly, information, vocabulary and comprehension. Those particularly subject to decline are block-design, similarities, substitution, arithmetical reasoning, and digit span. Wechsler's findings indicate that age-decrements on performance tests are as large as those occurring with timed verbal tests. Miles and Miles (1932) found that loss was greatest in items dealing with arithmetical reasoning and number relations, and least on vocabulary and synonyms-antonyms. Miles (1943) reports that scores on an information test of intelligence (Terman-Miles) exhibited increment up to the late forties, with decrement after age 50.

As has already been stated, most workers agree that vocabulary holds up extremely well until, at least, the beginning of the senile period. Vocabulary studies, however, have been the objects of a number of criticisms, one being that the vocabulary lists employed are not truly

representative of the words at the command of older persons. For example, as individuals progress in certain professions, such as medicine, there is a tendency for their vocabularies to become specialized. Kaplan (1943) has demonstrated that even when vocabulary levels are maintained over considerable periods of time, the same words may not be passed on the first and second tests. Presumably, vocabulary should increase during the life span of an intelligent adult armed with a dictionary.

Babcock (1930) has developed a Test of Mental Efficiency in which she uses the score attained on the Terman vocabulary list as an indication of a person's early adult intelligence, and a series of learning and speed tests to measure present efficiency. The difference between the two scores yields a measure of deterioration. The Babcock test has been criticized on the ground that although the correlation between vocabulary and general intelligence is high, it is far from perfect. Furthermore, Shakow and Goldman (1938) have presented evidence showing that vocabulary levels may begin to drop in the sixties, making vocabulary an unreliable index of early mental level. In a later publication, Shakow, Dolkart and Goldman (1941) found that psychotics had poorer vocabularies than non-psychotics, and that senile demented, on the average, were more deficient than arteriosclerotics with psychosis.

It cannot be denied that speed of performance is markedly reduced in older persons and that tests which emphasize speed discriminate against the more advanced groups. Still, speed is important in many occupations and its decline is deserving of note. Moreover, decline takes place even when the factor of speed is either reduced in importance or eliminated. Jones and Conrad (1933), Miles (1934) and Gilbert (1935) agree, on the basis of their experimental findings, that decline in intelligence takes place even when the factor of speed is eliminated, though Miles contends that speed declines more than power between 20 and 60, while the reverse holds for the period between 60 and 80. Lorge (1936) has investigated the relationship between age and test speed, using three age groups (20-25, 27½-37½, and over 40) equated for score on the Thorndike CAVD test, a power test. When he gave his subjects

the Otis Self-Administering Test, Thorndike Intelligence Test for High School Graduates, and the Army Alpha (all mixed speed and power tests), Lorge found that the older the group, the poorer the performance.

There is some evidence indicating that persons of superior intelligence and education are more resistant to mental decline than others with less native endowments and schooling. It has also been observed that persons who have been outstanding in youth tend to maintain their superior positions into the later decades of life. Miles and Miles (1932) point out that a person who scores in the 93rd percentile on the Otis would be found in the 50th percentile during the eighth decade. On the other hand, a person of average intelligence could be expected to drop to the 6th percentile by the age of 75.

Gilbert (1935) has shown that mental decline is slower in the more intelligent and better educated. Shalow and Goldman (1938) report that persons of very superior intelligence maintain large vocabularies into the eighth decade, while persons of only average intelligence show decline several decades sooner. Jones and Conrad (1933) however, found no tendency for standard deviations to increase in their older groups.

Few studies have dealt with the fate of intelligence in older subnormal individuals. Moore (1929) found that mental loss in idiots begins at an early age and long before adulthood is reached. A longitudinal study of intelligence in older morons has been published by Kaplan (1943). Using the 1916 Stanford-Binet, he found an average decline of only 6.65 mental age months in his group, of whom 9 actually added to their mental age during the period covered by the investigation. The average IQ of his group at the time of the first test was 57.01 and the average age was 41.17 years, with an average interval of 14.95 years between tests. An item analysis of the data showed that vocabulary levels remained almost stationary, while items dealing with lifted weights, memory, and comprehension did not hold up as well.

Whether the claimed better preservation of mental abilities in the brighter and more highly educated is real or merely an outcome of the type of material used in our tests is a

question that remains to be settled. It seems reasonable to suppose that persons engaged in occupations calling for the constant use of verbal skills have an advantage on verbal tests over others who have followed unskilled or mechanical pursuits.

The bulk of the existing evidence indicates that the rate of mental decline is about equal for the two sexes. Conrad, Jones and Hsiao (1933) administered the Army Alpha to 581 males and 607 females living in a rural area and ranging in age between 10 and 60. They found the performance of the females to be slightly superior to that of the males. The females were at a slight advantage on items calling for verbal ability and the males were somewhat better on arithmetic. Jones and his co-workers concluded that the effect of age upon sex differences in intelligence is determined by the composition of the test. In this connection, it is interesting to note that Price (1931) and Carter (1932) have reported lower negative correlations between age and test score in the case of women as compared with men.

E. INTERESTS

Interest trends among professionals have been studied by Strong (1931). Recruiting his 2340 cases from eight professions (engineers, doctors, YMCA secretaries, insurance salesmen, teachers, ministers, writers, and lawyers), he studied men ranging in age between 20 and 59.

He found that those activities which were most preferred at age 25 became even more popular at more advanced ages, while those pursuits which were not liked during early adulthood became even more disagreeable in later life. There was a marked tendency for passive activities to be preferred to active ones in the older age groups, and for group recreation to give way to amusements of a less social nature. In this connection, it may be noted that other studies have shown that this tendency is less evident in older women. Older men were less likely to engage in new activities. Enjoyment of reading increased. There was a significant correlation between age and attitude toward people: people with desirable traits were liked more, and people with offensive characters were liked less, than in early youth. Older people were less venturesome, as

indicated by their dislike for dangerous activities; sedentary activities increased in favor in the later decades. The number of items liked or disliked did not fluctuate markedly during the four decades covered by the study. About half of the changes in attitude took place between 25 and 35, with little or no changes beyond 55.

It is significant that the curves for extraversion and liking for strenuous activity are similar for all eight of the professions studied. However, original differences between the occupational patterns persist and far outweigh age changes common to all, and age differences.

In a more recent volume, Strong (1943) again affirms that occupational and sex differences are more important than age in shaping interests at the adult level, and that there are very few changes in interests beyond the age of 25. Thorndike (1935) has found substantially the same trends reported by Strong.

F. PERSONALITY

Our knowledge of the development of personality during the period of maturity is both scanty and spotty, and most studies have been of the cross-sectional type. The field of personality is so broad that comprehensive investigations are difficult to undertake. A further handicap derives from the existence of wide individual differences at every age level to the very end of life, making generalizations extremely hazardous. Many writers have emphasized that there is a continuity of personality all through the adult period.

Several investigators have noted age trends which are worthy of mention. C. C. Miles (1933) studied personality tendencies, as measured by the Bernreuter personality inventory, in 550 men and women of average and superior ability. She found that age correlated positively with "persistence," but could discover no age relationship for introvert or neurotic tendencies, self-sufficiency or dominance, as measured by the test. Willoughby (1938) found that women were significantly more emotional than men in the entire range between 20 and 70. Women increased in emotionality until about 30, then dropped until about 50, after which they experienced a final rise. Men showed little change with age. Lawton (1942) cites data

indicating that older men are more self-sufficient than older women, and show a greater preference for living alone. Terman and Miles (1936) have found that the attitudes and interests of men incline toward those of women as the men grow older. Morgan (1937) has found some correlation between health and happiness in elderly persons, the coefficient for the women being +.29 and for the men +.43. Health appears to be more important to the men than to the women. Kuhlén (1945) recently has summarized the literature on age differences in personality during the adult years.

Although personality is undoubtedly affected by the physiological changes attendant upon age, the importance of cultural influences cannot be overemphasized. Anthropological studies have shown that the personalities of older persons are greatly affected by the social environments in which they live. Adjustment depends not only on what and how much is lost, but on the role of what is lost in the vital activities of the individual, and the tolerance with which society regards his deficiencies.

It is interesting to note that crime rates decrease in the older age brackets. Although, according to the 1940 census, there were approximately ten million fewer persons in the age group 40-49 than in the category "50 and over," still there were fewer total offenses in 1943 in the older group, and fewer for each separate offense listed. Another statistic which is significant with regard to the personality of older persons is the fact that suicide increases among older white American males as compared with younger ones, while exactly the opposite trend obtains among male Americans of Negro race.

G. OUTSTANDING ACHIEVEMENT

Creative ability in relation to the life span has been extensively studied by Lehman (1936, 1937, 1941). He has come to the conclusion that the greatest number of contributions in science and art are made by men who are on the sunny side of 50.

A survey of the literature on distinguished achievement indicates that peak performances in athletics are generally accomplished by men in their twenties. Scientists, on the average, reach their full power in the early thirties.

Mathematicians, artists, musicians, and writers of prose most frequently do their best work in the late thirties. Astronomers tend to do their outstanding studies in the early forties. Statesmen and military leaders come into greatest prominence in the late forties and beyond.

It should be recognized that studies of outstanding achievement are concerned with individuals of extraordinary endowment who may not even be representative of the general membership of their respective professions, much less of the unselected population. Accordingly, it is possible that these findings are not indicative of the time of production of the best works of less gifted individuals.

Only recently has human life for the average person been extended beyond fifty and many men of genius still fail to reach it. Many of the great geniuses of the past died before they were forty. This fact has not been given sufficient attention in some of the published studies on outstanding achievement.

A large number of factors are involved in the achievement of outstanding success and these vary with the different occupations. Health and physiological factors are all-important in the case of athletes; generals cannot become famous without wars, and promotion is largely determined by procedures derived from precedent; the length of the training period and the state of scientific knowledge are important in determining the period of optimum productivity in science. In other words, factors of a non-psychological nature play a prominent role in determining the volume and quality of achievement.

Motivational factors play an important part in human productivity; the pronounced decline in output reported for scientists, writers, musicians, and artists is to be attributed largely to changes in motivational dynamics. There are numerous instances of opus magnum output in the later decades of life in all of these professions.

It would be risky to predict future peak decades of output in the various occupations on the basis of past experience. The organization of the various occupations is undergoing constant change. Thus, during World War II, the U. S. Air Corps has given stars to several men under thirty. The available evidence seems to indicate that superior achievement is possible

in most of the professions from the twenties until at least the sixties.

H. SUMMARY AND CONCLUSION

Poffenberger (1942) has summarized the results of experimentation on the psychology of maturity with the statement that maximal capacity in essential functions undergoes a decrement of approximately 1 to 1½ per cent a year between the ages of 25 and 55, with an increased rate of loss in the years beyond 55.

It would be foolhardy to assume that the essential facts regarding the psychology of the adult years are now in our possession. Our tentative conclusions are drawn from a limited number of studies, many of which are based on samples not fully representative of age groups in the general population.

Many criticisms can legitimately be directed to some of the studies mentioned in this chapter. There has, for one thing, been too great a dependence on single measures of performance. There has been too little emphasis on the differential effects of age upon persons following different occupations and ways of life. Little attention has been given to the interrelationship of the various factors that have been studied, with the result that many deeper understandings have escaped us. We have dissected the mature without bothering to appraise integrated and living personalities.

It is not always easy to separate cultural from physiological determinants. Presumably, however, those facts of the psychology of aging which are rooted in physiological processes are destined to enjoy a greater permanence than those that rest upon the social environment. It is conceivable that the oldsters of today may not be truly representative of the senior citizens of a generation hence, particularly with regard to those abilities or traits which are affected by sociological and educational influences.

We need to study the trajectories of individual lives. Most of our data are drawn from cross-sectional investigations and suffer from the limitations to which such studies are subject. Until we have followed a large number of careers from early adulthood to senescence, we cannot be certain that the course of decline is uniform for all, or, for that matter, that decline occurs in all individuals and in all functions. It is possible that when our measur-

ing devices become more appropriate, and when we have learned more about the fallibility of our methods of study, that our generalized curves may assume a somewhat different form.

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MENTAL HYGIENE.—*Definition and History of the Mental Hygiene Movement.* There is little disagreement to-day on the meaning and function of mental hygiene, even though it is a broad field with rather loosely defined boundaries. This science includes the prevention of inadequate adjustment as well as methods and techniques by which maladjusted individuals are aided in making wholesome adjustments. With the innumerable complex factors constantly mitigating against mental health, it is readily recognized that many of the sciences such as biology, applied psychology, and neurology are inextricably bound up with the prophylactic and meliorative processes. In other words, mental hygiene does not belong to any one field, nor is it obligated to accept the theory, philosophy, or findings of any one field in toto. Since it is fundamentally interested in prevention and restoration, it takes from the sciences primarily those processes which will aid in carrying out its purposes.

The term mental hygiene is not a new one. As far back as 1860 a book had been published by William M. Connell under the title of *How to Enjoy Life, or Physical and Mental Hygiene*. Mainly through the efforts of the National Committee for Mental Hygiene and its allied organizations the term has gained a wider significance.

The dramatic story of the beginnings of the

mental hygiene movement stems from the year 1908, when a young man, Clifford Beers, developed a serious personality maladjustment and became a patient in both public and private hospitals for the insane. Upon his successful recovery he was determined to devote the remainder of his life to improving the treatment and conditions of the mentally ill. The story of his commitment to various asylums and the harsh treatment which he received is candidly told in his book, *A Mind That Found Itself*, published in 1908.

This publication was the beginning of the mental hygiene movement which has spread to almost every country on the globe. The first State Committee for Mental Hygiene was organized May 6, 1908 in Connecticut. A year later the National Committee for Mental Hygiene was organized. The movement spread so rapidly that by 1919 it had attained international status and the International Committee for Mental Hygiene was established. The first International Congress on Mental Hygiene met in Washington, D. C., in 1930 and 50 countries were represented.

The story of the rapid growth of the mental hygiene movement reads like a fairy tale. Its accomplishments have been far greater than its founder ever dreamed. These achievements, however, have not been realized without overcoming a great many obstacles. Of necessity during the first few years, much time and energy were spent establishing a sound basis, financial and social, for a future program.

Originally the expenses were met by contributions from interested members in the field of mental hygiene, and financial support which Mr. Beers gave it indirectly through loans made to him personally.

In the beginning the activities of the National Committee for Mental Hygiene were directed toward the amelioration of the conditions in the hospitals for the insane. Many local, state, and national surveys were conducted which disclosed the intolerable conditions existing in such institutions. These surveys also made available for the first time pertinent data regarding the resources for the care and treatment of the mentally ill.

The presentation of these facts aroused public opinion to the extent that legislative changes enabled the recommendations to be put into effect. Through the use of the survey tech-

nique, information with regard to conditions existing in the penal institutions was obtained and reforms were brought about. Steadily but surely the field broadened to include the school and the community. Each step in the development of the program has approached more closely the origins of maladjustment. The mental hygiene movement has proceeded from the stage where the attention was directed primarily toward the humane treatment of patients in mental hospitals, to the level where emphasis is placed on the amelioration of conditions and the prevention of maladjustments.

Provision for Caring for the More Seriously Maladjusted. As has been suggested, one of the first objectives of the mental hygiene movement was to bring about a reformation in the attitude toward and the treatment of the mentally ill patients. This was a very difficult task and in order to make any headway it was necessary to educate both the scientist and the layman in the care and treatment of the mentally ill, and in the prevention of mental illness. As the movement grew and the scientific information became better organized, it also had the task of educating the public in the more appropriate use of terms. In this respect a great deal of progress has been made. The "lunatics" and the "crazy" people are no longer bound in chains and placed in "madhouses" or "insane asylums." Even the use of such terms as "crazy" or "insane" to designate the mentally ill is becoming obsolete. Some of the newer terms such as psychiatry, psychiatrist, psychiatric institute, sanitarium, retreat, psychopathic hospital are more or less familiar to the public. Recently the use of the term *psychiatric* has been questioned because of the possible misinterpretation of the causes of mental disease. A. J. Rosanoff has suggested *cerebrology* as a more suitable and scientific term. With all these accomplishments the original goal has not yet been reached. A great many people shudder at the thought of the existence of mental illness in the family. They must be educated to the point of view that mental disorders are the products of abnormal, unhealthy ways of living. A psychosis or neurosis is a maladjustment of the whole personality and in treating it consideration must be given to all the various causes including the hereditary, social, economic, physical and emotional. A very large percentage of the mentally ill never require commitment to an institution.

The unbalanced personality that has not yet become neurotic or psychotic but is badly adjusted to its environment is being given more attention. Such agencies as child guidance clinics, mental hygiene clinics, social adjustment centers, institutes of family relations, personnel departments in school, college, and industry are positive aids in developing well-balanced personalities.

The modern hospital for mental illness utilizes a great variety of techniques in the treatment of its patients. It attempts to give each patient the benefits of the latest and best scientific research in the field. The hospital is no longer a place for merely keeping the patient confined. It is a specialized institution where a definite positive program of analysis and treatment is followed. When a person is brought to a hospital for treatment an effort is made to secure an anamnesis, which gives as complete a description as possible of the patient not only during his mental illness, but also during his previous normal state. Also, upon entering the hospital the patient is given a thorough physical examination, since the mentally ill are not immune to the physical illnesses which are found among the general population. As a matter of fact, certain diseases are somewhat more prevalent in patients with mental illness than in other groups. Treatment is begun only after a thorough diagnosis has been made.

Probably the most important phase of the treatment is to make the hospital community an exceptionally pleasant place in which to live. Any patient will find in this environment some work either closely allied to the vocation he once followed or to a hobby in which he might have had an interest. It has been found that wherever it is advisable, considering the health of the patient, the "work cure" is much superior to the "rest cure" as a form of treatment. Therefore, a large percentage of the "guests" participate in some form of occupational therapy. In some of the less modern hospitals, chair-caning, basketry, weaving, and the like are still being continued. In the more modern institutions the "guests" participate in those activities and interests which can be carried on after they leave. Here we find the "guests" writing novels, landscape gardening, painting and sculpturing, learning to make dresses, taking bridge lessons, studying current events, taking university extension courses, and taking music lessons. Be-

sides occupational therapy many other kinds of therapy are appropriately applied to each individual. Some of the other more important treatments are hydrotherapy, electrical therapy, pyrotherapy, drug therapy, physiotherapy, suggestion therapy, psychoanalysis, surgery, and dietetics. Also, a great deal of attention is given to the social program. The patients organize their own dramatic clubs and musical organizations, and give programs which the others may attend. Likewise they may listen to the radio, attend motion pictures or engage in athletic activities of various kinds. Church services are conducted regularly and in most hospitals library facilities are provided.

The Contributions of Mental Hygiene. Data show that approximately one person in twenty-two becomes a patient in a mental hospital in a single generation. This fact alone reveals the importance of the meliorative phase of the mental hygiene program. It is necessary that the 500,000 psychotics have some place to go where they may receive treatment in order that they again may assume their rightful place in society. The neurotics form a much larger group which needs treatment. These adult individuals seem unable to develop a stable personality. A relatively small number of these neurotics are so seriously maladjusted as to be committed to an institution. However, they are in constant conflict not only with their associates but also with themselves. This condition is a source of much unhappiness and individual inefficiency. Certainly they were not born neurotics but this neuroticism is a result of many experiences in childhood that have had a detrimental effect on the developing personality. Every child has certain fundamental needs which are very similar to those of every other child. However, every child possesses characteristics that make him different from every other child. These differentiating factors make it extremely difficult if not impossible to satisfy these needs in the same ways. Ignorance or unwillingness on the part of parents to recognize the importance of forming wholesome habits in early childhood may account for a great deal of maladjustment later in life. The amount of emphasis placed upon the formal curriculum in a competitive atmosphere motivated primarily by marks and promotions, and the fear of failure instilled by teachers who lack skill in understanding children have no doubt contributed their share of maladjust-

ment. The positive purpose of mental hygiene is, therefore, to help the child satisfy his basic needs in a socially acceptable manner.

The parents, first of all, must provide proper physical care and protection. While this may not be essential, such care is a basic item in the development of a wholesome personality. Any illness which the child may have or any physical defect which he may possess militates against his developing mentally healthful behavior patterns. It is under these conditions that the parents may over-protect him, and thus cause him to be too dependent or to develop a fear of further injuries or illnesses. One possible result of over-emphasis of the problems of health is the hypochondriac who exaggerates his illnesses or even believes he is ill when he is not. This is also a chance for the child to feign illness when he has some difficult or disagreeable task to perform. The parents must realize the importance of forming socially acceptable habits very early in life. Sufficient experimental data exist which show that these early behavior patterns persist with a great deal of tenacity. Two other important home sources of behavior problems are those of the broken home and those in which the home atmosphere is mentally unhealthful. Every child has the right to two parents living together in a congenial intra-family relationship.

From the writer's point of view it is the function of the school to carry out both the meliorative and prophylactic phases of the mental hygiene program. It is extremely difficult to determine just where prevention leaves off and treatment begins. This is especially true when we think in terms of the minor maladjustments and when we realize that no human being can understand every child perfectly. Childhood offers the best opportunity for constructive mental hygiene and therefore the schools should recognize certain principles derived from the best research in the field of mental health. It should be remembered that mental hygiene is a way of life, an attitude, a point of view, which has as its goal a wholesome, happy, well-balanced life. This atmosphere should permeate the entire school system.

It is only natural that teachers want to see their pedagogical labors achieve their maximum effectiveness and this effectiveness is exhibited most vividly in the more academic subjects. They should, however, seek to educate the total

personality. They should develop in their pupils the most mature expression possible of intellectual capacities and emotional responses. The slighting of any one or more phases may deprive the child of part of his education and may develop a warped personality. Therefore, the curriculum should be constructed so as to make provision for the all-around growth and development of the child. The knowledges and skills should be used primarily as means to ends rather than ends in themselves. The curriculum should be sufficiently broad in scope and flexible in function to meet the needs and interests of all the children.

The atmosphere of the classroom is another important phase which the school should consider. It should be congenial and friendly, and the cooperative spirit should dominate at all times. The child should feel secure and at ease as he participates in the various activities. The home and the school are the two centers where the child should learn to live and work cooperatively. This whole problem of classroom atmosphere is tied up very closely to the one in charge of the children—the teacher. It is impossible to expect to have mentally healthful children unless the teachers possess well-balanced personalities. There has been a great deal of discussion in the last two decades concerning the importance of the selection of teachers and some headway has been made. Even though the personality of the teacher is the most important single factor in the educational process, it has been only recently that any attention has been given to this phase of selection, except for the elimination of people with the more bizarre deviations. Most emphasis has been placed on the knowledge of the subject matter and methods of presenting that knowledge to children. In the last few years a few meager attempts have been made to consider the factor of wholesome adjustment in the selection and certification of teachers. However, no long term studies have been made to determine the validity of the techniques used. From a mental hygiene point of view, the future teacher must possess a well-balanced personality, a functioning knowledge and understanding of human behavior and must be convinced that the adjustment of human beings to social living transcends factual knowledge or techniques of presenting that knowledge to children, important as these may be. This implies that the

teacher of the future must be recognized as a human being. He has need for a feeling of security, for recognition of personal worth and accomplishment, for affection, and for favorable conditions of work as well as living.

A third important phase which the school must consider is that of appraising development. The school no longer can simply evaluate pupil progress in terms of subject matter learned and skills acquired. The results of any appraisal must be considered in the light of the child's general mental maturity, his physical condition, and his social and economic background. Every evaluation should be made with the primary purpose of helping the child. Tests and examinations are not the only ways for measuring pupil progress. Observation of how the pupil goes about his work, how he cooperates and plays with other children, and a knowledge of his attitude toward school in general may be even more important than knowledge of the grade level on which the child is reading. In any modern appraisal program the teacher must possess the diagnostic point of view. He must determine the *causes* of the difficulty and then apply appropriate treatment.

Mental hygiene plays an important part not only in the home and school but it operates in every walk of life. In industry provision is being made for better working conditions. More cordial relations are being fostered between employer and employee. Problems arising between the administration and the workers are being discussed by representatives from each group. Analyses of the strengths and weaknesses of the worker are being made in an attempt to place him where he is most efficient. Personnel experts are being employed to aid workers in adjusting some of their more personal problems. The industrialist has learned that a happy and well-adjusted worker is a producer.

Possibly in no other field have the principles of mental hygiene been applied more avidly than in World War II. Beginning at the induction station and continuing until the service man received an honorable discharge, an attempt was made to decrease the number of neuropsychiatric casualties. Especially after the return of the service men was it necessary for everyone to apply the basic principles of mental hygiene.

One may go on endlessly and point out the various fields of endeavor toward which the

principles of mental hygiene may apply. The ones discussed give an idea of the progress the mental hygiene program has made since its inception less than forty years ago. They also should present a challenge for a wider application of its principles in the future.

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MORALE.—Morale is a term which comes into prominence during crises when the conditions to which it refers are painfully absent or conspicuously present. These conditions were defined by a committee of psychologists meeting under the auspices of the National Research Council in 1940. The definitions, as reported by Child (1941), were as follows:

I. (The individual-organic emphasis.) The term *morale* refers to a condition of physical and emotional well-being in the individual that makes it possible for him to work and live hopefully and effectively, feeling that he shares the basic purposes of the groups of which he is a member; and that makes it possible for him to perform his tasks with energy, enthusiasm, and self-discipline, sustained by a conviction that, in spite of obstacles and conflict, his personal and social ideals are worth pursuing.

II. (The group emphasis.) *Morale* refers to the condition of a group where there are clear and fixed group goals (purposes) that are felt

to be important and integrated with individual goals; where there is a confidence in the attainment of these goals, and subordinately, confidence in the means of attainment, in the leaders, associates, and finally in oneself; where group actions are integrated and cooperative; and where aggression and hostility are expressed against the forces frustrating the group rather than toward other individuals within the group.

III. (Emphasis on individual-within-the-group on any specific occasion.) Given a certain task to be accomplished by the group, morale pertains to all factors in the individual's life that bring about a hopeful and energetic participation on his part so that his efforts enhance the effectiveness of the group in accomplishing the task in hand.

In this discussion morale will be used in a fashion similar to the "group-emphasis" above to refer to the degree to which the individual members of any defined group are united and motivated in their efforts to achieve a common goal. Technical usage of the term morale should involve the following considerations: (1) the particular group to which the term is applied; (2) the degree of unity within the group; (3) the strength of motivation present in the group; (4) the specific goal toward which the efforts of the group are directed.

Team morale, employee morale, military morale, enemy morale, and civilian morale, refer to the morale of particular groups with respect to particular goals. Unity within each of these groups implies a willingness to cooperate among the individual members. The determination with which the group pursues the goal is dependent upon the strength of motivation present. The goal itself, for each of these groups, may be positive or negative in character. A group, for example, might have as its positive goal the attainment of a certain production total. Another group might be organized around a negative goal such as the avoidance of defeat.

Morale, as this discussion indicates, is a matter of degree. High morale depends upon the degree of unity and the strength of motivation present within the group. Low morale may be the result of lack of unity, i.e., unwillingness to cooperate, among members of the group. In an industrial plant, management and employees may be agreed upon a stated production goal but may differ in their beliefs as to the best

method of achieving the goal. In the absence of unity between the two groups, regardless of the fact that they have a common goal and may both be equally determined to achieve the goal, plant morale may be low. Low morale may also be the result of relatively weak motivation. A group may be united in its efforts to achieve a common goal, but a strong desire to attain the goal may be lacking.

Any group may be conceived as having a social structure. The social structure defines permissible patterns of behavior and other patterns which are not. These behavior patterns in turn become associated with values, emotions, and sentiments. A social structure once established tends to have a certain stability, i.e., it is resistant to change. If a social structure permits satisfaction of desires and motives of the individual members and also serves to unify the efforts of the group as directed toward some common goal, the structure is said to be in a state of equilibrium or balance. It is under these conditions that the morale of a group is at a maximum. If the social structure is such that it demands more in the way of sacrifice of individual motives and ambitions than the individual members are willing to yield, then morale declines. If an athletic team, for example, demands too many sacrifices, then individual members of the team are apt to violate the prohibitions; the unity of the group is destroyed and morale drops. In a similar fashion if a nation at war demands sacrifices beyond the maximum which the people are willing to make in the interests of achieving the common goal of victory, there is also a lowering of morale. On the other hand, if the social structure does not necessitate some surrender of individual desires, then the unity of the group may suffer with a consequent lowering of morale also.

Various lists of the components of morale have been made, but these lists are at best shrewd guesses. With respect to military morale they have included such things as: freedom from anxiety, sense of pride, confidence, sound health, good food, and so forth. When we stop to consider that some military units have maintained high morale in the absence of many of the factors usually contained in such lists, we must acknowledge that the exact components of military morale are not known. One factor, however, which has appeared in both military

and industrial surveys of morale, is that of leadership. Coöperation and strong motivation seem to be characteristic of groups which have satisfactory relationships with leaders.

One survey of military morale reported in *Psychology for the Fighting Man* (1943) revealed that high morale was associated with:

1. Leaders who were competent and had the necessary abilities which their positions as leaders demanded.
2. Leaders who were able to make decisions promptly when required to do so.
3. Leaders who had the interest and welfare of the members at heart.
4. Leaders who made things clear to the members; who gave orders in a manner that showed every member exactly what was expected of him.
5. Leaders who were impartial and did not play favorites with individual members.
6. Leaders who rewarded members by judicious words of praise or by some other form of recognition when a job had been successfully executed.

Similar surveys of industrial morale indicate that rest periods, wages, ventilation, temperature, lighting, and other physical factors which were once considered of great importance in determining morale by industrial engineers, do not deserve the stress they were formerly given. The work of Roethlisberger and Dickson (1943) and Mayo (1933) indicates that human relationships in industry, as in the army, are of far greater significance as far as morale is concerned.

The athletic teams of coaches such as Knute Rockne and Paul Brown, who have observed the importance of human relations in dealing with the members of their teams, are known for their high morale in time of defeat as well as in victory. The extent to which the German peoples' confidence in the leadership of Adolf Hitler kept them unified even in the face of defeat and extreme hardships is a factor which may eventually be analyzed.

During times of crises such as floods, depressions, earthquakes, wars, and other disasters, morale becomes a subject of national importance. That is because the individual efforts of all members of a country must be united if the emergencies of the situation are to be met. A

war obviously requires that the individual citizens be united and determined in their efforts to defeat the enemy if the war is to be successfully carried through to completion. Civilian morale must be maintained at a high level if production goals are to be met, bonds are to be bought, and rationing and other wartime regulations are to be willingly accepted. Morale of the armed forces is of vital importance if military operations are to be successful.

In modern war also, with the development of radio and other means of communication, the state of morale of one country is open to attack by another. If it is possible to destroy the unified efforts of a country or to weaken its determination to wage war by means of propaganda, military operations of that country are impaired. The German propaganda theme of World War II, "divide and conquer," expresses the point. Most governments maintain during war periods agencies or departments whose function it is to look after the state of morale on the home front and to plan systematic attacks upon the morale of enemy countries. Even within the armies, units have been established to wage similar psychological attacks upon the morale of opposing combat troops.

Morale can be estimated insofar as it is possible to discover the degree of unity of effort within a given group and the determination of the group to achieve a common goal. Allport (1942) has provided an extensive list of sources of evidence pertaining to morale. Responses to opinion polls on such items as confidence in leaders, willingness to sacrifice, and agreement with government policies are indicative of national morale. Civilian morale might also be estimated by the degree of participation in salvage programs, blood contributions, bond buying drives, and other activities of national concern. Analyses of the press, including letters to the editor, columns, features, and editorials may provide additional information. Evidence concerning industrial morale may be obtained from data on strikes, labor turnover, and production, as well as from surveys of opinion. In the armed forces interviews and opinion polls, and statistics on desertions, AWOL, suicides, disciplinary actions, and malingering, might be used as sources of information concerning morale.

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MOTIVATION. — Practical importance.

Questions concerning motivation arise in every field of applied psychology. In educational psychology there are problems concerned with the relative effectiveness of praise and reproof, reward and punishment, success and failure, competition and coöperation; of working with or without knowledge of results or a definite goal or enthusiasm. In clinical psychology and psychiatry motivational problems center around the explanation of frustrations and conflicts and such symptoms as tics, amnesias, functional paralyses, dissociations. Legal psychology carries a heavy load of motivational concepts—intent, choice, will—but too often does not interpret human conduct according to modern psychological principles. In the eyes of the law the difference between murder and manslaughter is one of intent or motive. In industrial and military psychology problems of motivation relate to morale, effectiveness of different systems of payment and hours of work, the psychology of participation, efficiency of work as related to illumination, temperature, distraction, music, and other environmental factors. In personnel psychology and the art of counseling, the aims, interests, and evaluative attitudes of an individual are as basically important as his skills and achievements. In all these and other areas a workable psychology of motivation is essential.

- *Definition.* Motivation is the process (a) of arousing or initiating behavior, (b) of sustain-

ing an activity in progress, and (c) of channeling activity into a given course. Broadly considered, the analysis of motivation must take account of all factors which arouse, sustain, and direct behavior.

The concept of motivation is thus a very broad one. It is not so broad as psychology itself, however, since psychological explanation includes consideration of both non-motivating and motivating factors.

The nature of the motivational process is highly complex. Its underlying biological bases will be considered first, after which the social and experiential aspects will be examined, theoretical implications following.

Equilibrium and bodily need. The single most basic biological factor in the motivation of behavior is the necessity of meeting the bodily requirements for survival.

In 1859 Claude Bernard described the internal environment of the body in which the cells exist. He demonstrated that in mammals the physicochemical properties of this internal environment vary within fixed limits and that variation outside of these limits endangers life. More recently Cannon (4), after a series of careful experiments, confirmed and extended the views of Bernard. Cannon coined the term *homeostasis* to designate a relatively constant physicochemical state within the body. The relatively constant states of the body are maintained through the coöperative action of the brain and nerves, heart, lungs, skin, kidneys, spleen, and other organs.

This doctrine of Bernard and Cannon provides a workable basis for defining the physical needs of an organism. In order to maintain homeostasis, an organism must obtain from its environment definite quantities of oxygen, water, fat, protein, carbohydrate, minerals, and certain of the vitamins. Further, the body must be maintained in temperatures within a definite range. The waste products of metabolism must be eliminated. Sleep, rest, and activity must be obtained. (A *need* is a requirement for maintaining homeostasis and thus ultimately a requirement for survival itself;) or for growth, reproduction, normal activity, a sense of well-being, and freedom from disease.

In his Harvey lecture, Richter (19) pointed out that the behavior of man and animal is directed toward the maintenance of a constant internal environment. This thesis is supported

by much evidence. A single illustration will suffice: Normally the pituitary and thyroid glands, in coöperation with other organs, regulate the internal temperature of the body. If these glands are surgically removed, rats lose their ability to produce adequate amounts of bodily heat. The deficiency is corrected for in the animals' behavior by a greatly augmented tendency to build nests out of strips of paper. The nests conserve bodily heat just as clothing or a dwelling does for man.

The theory that behavior is directed toward the maintenance of homeostasis has been extended by psychologists to include the maintenance of internal equilibria which are not essential to survival. Thus Freeman (7), with a bias toward *Gestalt Psychologie*, has defined motivation as a condition of disequilibrium within an organism which leads to action for the restoration of equilibrium. Motivation, he says, is not the stimulus nor an object sought but a state of disequilibrium within the organism. The sight of a piano, for example, does not compel the musician to play. Before he performs there must be an inner desire to play. The desire is a state of disequilibrium within the bodily mechanisms which regulate behavior.

Freeman's theory suggests the complacency theory of Raup (18) and the closure theory of Koffka (13). These theories all agree in that they emphasize the basic importance of disequilibrium and the restoration of equilibrium through behavior.

The view that the rôle of behavior is to meet the needs which restore internal equilibrium (homeostasis, complacency, stability, balance) is satisfactory as far as it goes. The view must be supplemented, however, by an objective description of those bodily processes through which needs are met and equilibria restored.

Biological drives. The term *drive* commonly refers either (a) to persistent behavior which is typically goal-directed or (b) to the internal stimuli which release such behavior. For clarity these two main aspects of drive will be called *behavioral drive* and *physiological drive*. There is also a *conscious* aspect.

A behavioral drive is illustrated by the persistent attempts of a man lost on the desert to find water. This dominant drive motivates subordinate activities which lead up to the goal-response of drinking. The goal-response re-

duces the drive and brings the episode in behavior to a close. In this instance the physiological drive is the persistent stimulation of nerves due to the dry condition of the tissues in the throat and mouth. This stimulation also underlies the unpleasant pressure-pain which the thirsty man experiences.

The behavioral aspect of drive has been emphasized by Warden (26), Tolman (23), and Skinner (21). Warden states that a drive is an aroused reaction tendency which is characterized primarily by the fact that the activity of an organism is directed towards or away from some specific incentive, such as food, water, animal of the opposite sex. He makes it clear that the term *drive* does not refer to the physiological state or system aroused either by an incentive or by a deprivation of some sort. The term refers directly to the behavioral tendency resulting from the internal arousal.

Tolman, following Craig, subdivides the primary drives into two groups: appetites and aversions. An appetite is observed as an agitated state of behavior which persists as long as a certain stimulus-object is absent. An aversion is also observed as a state of agitation but it is one which continues as long as a certain stimulus-object is present. Appetites are cyclic; they appear and disappear. Aversions, contrastingly, depend upon external circumstances which arise irregularly and unpredictably. For example, if an enemy appears, the aversion is revealed by aggressive behavior. According to Tolman, there are two main human aversions: fright, which leads to avoidance, and pugnacity, which leads to attack.

Skinner holds that psychology is a pure science of behavior without physiological entanglements. For him a drive is defined as a hypothetical organic state. A drive is assumed to exist on the basis of a relationship between observed behavior and certain laboratory operations. For example, after a rat has learned to press a lever to obtain pellets of food the rate at which he presses this lever can be shown to vary with the period of food deprivation. The relationship between rate of pressing the lever and period of deprivation can be described by a graph or an equation without postulating any hunger state. It is convenient, however, to postulate a hunger drive within the organism.

The physiological aspect of drive, on the

other hand, has been emphasized by Dashiell (5). He defines a drive as a condition within an organ or tissue by which an animal is set into activity. This view of drive stresses the bodily sources of stimulation which release the energy of behavior. Goal-directed behavior is *driven* by these internal stimulations.

Young (28) has distinguished between primary and secondary drives on the basis of their internal or external origin. A primary drive, such as micturition, is one for which the bodily mechanism arousing the characteristic behavior has been objectively described and differentiated from the bodily mechanisms of other drives. A secondary drive, such as flight from an enemy, is one which originates in the environmental situation and for which no characteristic bodily mechanism has been discovered.

The following drives can be listed as primary motivations: hunger for food, thirst for water, the urge for air, the drive to maintain an optimal bodily temperature, the drive to defecate, the drive to micturate, the drive to rest after protracted exertion, the drive to be active after prolonged inactivity, the drive to sleep following protracted wakefulness, the drive to copulate, and a female drive to nurse the young. The list is conservative and will probably be revised by extension and subdivision rather than by eliminating the drives listed.

For every primary drive there is a characteristic goal-response which meets a bodily need. Thus, for fatigue the goal-response is resting; for thirst the goal-response is drinking; for the internal sexual drive the goal-response is copulating. The primary biological drives can be described either in terms of internal bodily mechanisms or in terms of the characteristic goal-responses which meet needs and restore homeostasis.

In addition to the primary biological drives there are other organic and environmental factors which play a dominant rôle in behavior. In an important study Anderson (2) gave male albino rats a variety of tests of motivation and learning. The test scores were intercorrelated and factor analyses made. He found evidence that the traditional drives of hunger, thirst, and sex operate to determine individual differences in performance. More important than the traditional drives, however, were several factors of broad scope. Some of these broad factors (the

general level of activity; emotionality) probably have an organic basis. Other factors (exploration; aptitude for a particular apparatus) depend upon the particular environmental situation. Further studies of this type are indicated.

Internal and external determinants of behavior. In all purposive behavior there is both an internal and an external aspect. Some activities, such as food-seeking by a hungry organism, are motivated mainly by internal stimulations. Others, such as exploring a novel environment, are determined mainly by external conditions. Some behavioral drives have both internal and external determinants. For example, the sexual drive rests upon an internal bodily state and the presence of a mate in the environment.

The extent to which internal and external factors determine behavior varies with habituation. For example, hunger originally is an internal condition of the organism. If an animal satisfies his hunger over a long period of time in a relatively constant environment, the patterns of behavior which lead to the reduction of hunger come to be aroused by environmental stimulations. Thus a laboratory rat may learn to reduce the hunger drive by running a maze, escaping from a problem-box, discriminating between visual forms, crossing an electric grill, digging through sand, running back and forth between food and starting-box, pressing a lever, jumping a gap, or through other activity that leads to food. After he has learned to operate the gadgets of the laboratory he will operate them (at least for a while) even when satiated.

Anderson (3) has shown that patterns of behavior originally motivated by physiological drives become, through conditioning, more and more controlled by external conditions. He has called this the *externalization* of drive. Externalization of drive spreads from one stimulus-object to another until finally a great many stimulus-objects associated with the reduction of hunger come to arouse the instrumental activities. If externalization were complete, the behavior which leads to feeding could be aroused almost in full strength by presenting the environmental conditions in the absence of bodily hunger. In a word, behavior originally motivated by internal determinants becomes increasingly controlled by external determinants.

From another point of view the process of learning can be described as the *internalization*

of the environment. By this is meant that the neural organization of an individual is developed for the reduction of drives in particular environments. In a real sense a man learns to meet his biological needs according to the rules of his own society. The socially approved patterns of behavior are internalized in terms of habit-organization and attitude.

Social incentives and motives. Social incentives are the spurs and checks to behavior which originate within the social environment. Social motives, in the narrower meaning, are the aims and purposive determinations of an individual living in a social world.

A great many experiments have been carried out upon social *incentives*. The typical aim of such experiments has been to compare the relative effectiveness of such incentives as praise and reproof, reward and punishment, competition and coöperation, and so on. For illustrative purposes brief references to some of this work are given below:

Hurlock (12) found that the consistent use of praise was more effective than reproof as an incentive for school children. But in a more recent study Schmidt (20) concluded that neither praise nor reproof can be singled out as the superior incentive. The relative effectiveness of these incentives depends upon the social situation, especially upon the personality of the experimenter.

Hamilton (9) compared reward and punishment. With one group a bell was sounded as a reward for the correct adjustment of a Galton bar and with another group the same bell was sounded as a punishment for errors. The experiment was planned so that reward and punishment would be given with about the same frequency. Although there was slightly more improvement with punishment than with reward, the difference between these incentives was not significant. Muenzinger (15) obtained a similar result with rats on a brightness discrimination problem. With one group of animals a moderate electric shock was used as a punishment for errors and with another group the same degree of shock was employed as a mark of correct responses. The shock-wrong group learned the discrimination slightly faster than the shock-right group but not significantly so. The shock, however, had a general motivating effect, clearly apparent when the shocked groups were compared with a non-shocked control. From both

of these studies, different as they are, we may conclude that punishment and reward are about equally effective *provided the physical characteristics of these incentives are the same.*

The experiments upon competition and coöperation have been summarized by Vaughn and Diserens (25) and by Murphy and Newcomb (16). On the basis of these reviews it may be said that individuals respond differently to competition; some are facilitated and others inhibited or disrupted by competitive work. The capacity to compete or to coöperate appears to be present in all human beings; but some societies tend to develop competitive and others to develop coöperative behavior.

In general, the experiments upon social incentives suggest that we cannot make absolute comparisons of praise and reproof, reward and punishment, competition and coöperation, etc., if these incentives are abstracted from the concrete situation in which they exist. The effectiveness of these incentives is relative to the kind of social situation in which they are embedded. Every comparison should be qualified by the phrase "in such and such a situation."

Social motives—specific determinations to act, social aims, and purposes—originate in the social situation. For example, when a mother instructs her child to go to the store and buy a loaf of bread her words build up a mental set which directs and energizes behavior. A suggestion or a command, whether given by word or gesture, may build up in the individual a specific determination to act.

Some purposive determinations refer to remote social goals. When a young man has determined to study medicine this determination persists over a period of years. It underlies much of his daily activity. For long periods of time, however, this determination may be latent, not apparent in behavior.

A latent determination to act differs from a latent attitude or habit in that it is more specifically goal-oriented. An attitude is a readiness to respond positively or negatively to a psychological object and in a particular manner. There are attitudes of love, hate, fear-avoidance, resentment, disgust, amusement, inferiority, self-confidence, etc. Although such attitudes are latent much of the time, they are aroused in the appropriate social situations.

One particular group of attitudes is of special psychological importance: the attitude toward

one's self. Through inter-personal behavior an individual comes to understand his status in the group, and the rôle he plays; he learns how important or unimportant he is in a variety of inter-personal relationships. He develops attitudes of assurance and self-confidence, based upon success, or attitudes of inferiority, based upon failure. The attitudes of self-regard have a very marked effect upon the efficiency of his performance.

In addition to attitudes the individual, through inter-personal behavior, acquires habit-organizations. He learns to speak his native tongue. He learns to dress, to eat, to court, to hunt, to sleep, to play, to work, in accordance with the behavioral patterns of his group.

Habit-organizations differ from attitudes in that the former simply exist as bits of psychological organization. Attitudes are predispositions to react *towards* or *against* some psychological object. And social motives are still different in that they are goal-oriented determinations to act.

Habit and drive. Through a process of learning a man acquires the ability to add and subtract, perhaps, to drive an auto, to play a violin. He carries around with him these "possibilities of action," as Woodworth (27) called them. Motivation was necessary for the original learning of these activities. Motivation selects from the potential activities the one to become actual in behavior. Motivation is always a *contemporary* process, implying a release of energy at the time behavior occurs. Latent habit-organization does not motivate; it merely predisposes the individual toward certain patterns of behavior.

A habit has two main aspects. From one point of view it is an acquired pattern of behavior such as typewriting a familiar word. From another point of view it is the acquired neural organization which is the basis of habitual behavior.

If an organism performs some act which reduces a drive, this act is more likely to be repeated in the future when the organism is placed in a similar situation. For example, if a hungry rat obtains a pellet of food by pressing a lever, he is more likely to press the lever the next time he is placed in the apparatus. Pressing the lever is an instrumental act which brings food. The food is a reward which reduces the drive. The eating of food reinforces the instru-

mental act, *i.e.*, increases its probability of occurrence. The strength of a habit depends upon the number of previous reinforcements and their distribution in time.

If the reward is withheld, the habit is weakened. Eventually it is extinguished. The number of non-reinforced responses required to extinguish a habit varies with the number of previous reinforcements and also with the strength of the drive. Hull (11) has shown that if a rat has learned to obtain a pellet of food by pressing a bar, the probability that this conditioned response will occur is dependent upon two main factors: habit strength and strength of drive (measured in terms of the period of food privation). Practically, this means that in predicting behavior one must take account of previous training as well as motivation.

Hull's work implies that if the strength of drive is reduced to zero, through satiation, the conditioned response will still occur when the animal is placed in the accustomed situation. This implication has been confirmed in several experiments.

The doctrine of functional autonomy. Allport (1) has argued that a habit may become self-motivating, or functionally autonomous. As a man advances from infancy to maturity the character of his motivation alters so radically that we may speak of adult motives as having supplanted those of infancy. Adult motives differ widely from person to person. The motivation of each adult is unique. With Leo Tolstoy, for example, the *Leitmotif* was the simplification of life. A person who knew this dominant motivation could predict Tolstoy's probable reaction to certain types of situation. But any attempt to attribute Tolstoy's personality to extrinsic drives or instincts would be futile. Behavior becomes functionally autonomous.

The doctrine of functional autonomy clears the way for a dynamic psychology of traits, attitudes, interests, and sentiments. These, Allport believes, are the ultimate and true dispositions of a mature personality.

In appraising this doctrine we should note that nothing is added to the facts by the statement that a bit of behavior is autonomous. One is not greatly enlightened by the statement that "Sammy goes because he goes." On the positive side, Allport's doctrine is a challenge to psychologists to reveal the actual motivations of acts which are seemingly autonomous. If we

start from the assumption that all behavior is motivated at the time it occurs, then some motivation must be present even in the most automatized tic or habitual performance. The problem for the psychologists is to discover what motivation is actually present.

Postural set and neural readiness. If a child is instructed to repeat the letters of the alphabet, starting from *A* and going to *Z*, the chances are that he will do so. The instruction is motivating in that it builds up a determination to act in a specific manner and sustains the verbal sequence of behavior. Such a serial habit is possible, however, only after a period of learning. The well learned habit goes along so smoothly that it seems to be self-motivating. When the child pronounces the letter *A* the proprioceptors are excited in a characteristic pattern which immediately precedes the next unit of response: pronouncing the letter *B*. One unit of the serial habit comes, through conditioning, to excite the next and so on through the alphabet from *A* to *Z*. The proprioceptive pattern of stimulation is an important part of the total motivation but this alone could not initiate and sustain the serial habit. The determination to repeat the alphabet is essential.

Under some circumstances a determination to act in a specific manner is outwardly observable as a postural set of the organism. For example, when a runner is toeing the line and awaiting the gun his stance is a preparation for starting the race. The firing of the gun simply releases behavior for which the runner is prepared.

Frequently, however, the postural set is covert. A resolution to keep an appointment downtown, for example, may not be apparent in behavior. The resolution is an internal set which regulates the course of impending behavior.

There are two main hypotheses concerning the way in which an organism carries a covert determination from one time to another. First, such a determination may be carried by actual tension in some group of muscles, skeletal or smooth. Second, it may be carried as a purely neural readiness without any tonic change in the muscles.

To illustrate the reasonableness of assuming a neural readiness consider the college professor who has prepared a lecture to be delivered the next day. After some study he is mentally set

for the talk. He has prepared some notes which can furnish cues for the arousal of mental sets and the prepared words of the talk. The cues from the notes are part of the total motivation during the presentation of the lecture. These cues activate a latent readiness to respond. It is difficult to imagine how the complex preparation to deliver a lecture could be carried in terms of muscular tension, especially in view of the fact that between preparation and delivery all of the professor's muscles were relaxed in deep sleep. Further, these same muscles were utilized in a great variety of ordinary activities.

A neural readiness is latent, non-motivating, from one time to another. External stimulations activate this readiness and build up a characteristic tension. The tension stimulates the proprioceptors and thus furnishes an important part of the total motivation.

In this connection reference might be made to a view expressed by Stagner (22). In discussing functional autonomy he argued that each habit has its own characteristic drive. The drive becomes apparent when an habitual activity is temporarily checked. For example, a man is accustomed to reading the newspaper each evening upon arriving home from work. The situation of arriving at his home builds up a bodily tension of expectancy which leads him to get the paper from the front yard. Let us suppose that one day the paper is missing. The man now searches the yard. Failing to find the paper, he attempts to borrow one from his neighbor or he walks to the corner store to purchase a copy or he hails a newsboy. The persistent tension aroused by the situation motivates a variety of activities until finally one of them is successful in removing the tension.

Thus, it is our view that pure neural readiness exists and that it is not motivating, that this neural readiness determines the pattern of muscular tension aroused by external and internal stimulations, and that the muscular tension (through stimulation of the proprioceptors) is an important source of motivation. The stimulations from the goal-set or the task-set or the situation-set is a definite motivation which is different from that considered in the discussion of the biological drives.

Muscular tension and behavior. The work of G. L. Freeman (8) and others has shown that every individual has a characteristic level of muscular tension. The level of tension varies

with age, metabolic rate, the amount and degree of external stimulation, postural set, frustration, and other factors. The level of tension can be raised by stimulating the organism with lights or sounds or contacts; it can be lowered by reducing these stimulations.

The level of postural tension has an important relation to the efficiency of human performance. Every skilled act has its optimal level of tension. The optimal can be defined in terms of the quantity and quality of work produced. If the postural tension exceeds the critical level for a given task, there is a lowering of the efficiency of work. If the level of tension is very high, a skilled act may be completely disrupted.

There is little doubt that motivation can be regarded as a *quantitative* variable. It varies in degree. One can speak of under-motivation, optimal motivation, over-motivation. The optimal degree of motivation varies with the difficulty of the task, with the skill, precision and co-ordination of movement involved.

Physical and chemical determinants. When behavior is viewed as a physical process the factors which motivate activity must also be regarded as physical in nature. From the point of view of physical science the problem of motivation is to describe how the energy which underlies behavior is released and directed. Viewed in this light, every stimulus which arouses a response is motivating.

Stimuli which release energy and thus motivate behavior are of different kinds: mechanical, electrical, chemical. They are organized into an infinite variety of patterns in space and time. The stimuli which motivate behavior originate in different places: at the surface of the body from the external environment, in the proprioceptors, in the smooth muscles. Despite all of this variety in the stimuli the energy which is manifest either as behavior or as heat is of one kind: physical energy.

The expenditure of energy underlies all of the work accomplished by the human organism. Incidentally, the energy cost of this work can be measured. The stored-up energies of an organism are expended in one kind of activity or another according to the habit-organizations, attitudes, and purposive determinations which are present. What Freud called *sublimation* can be re-described as the re-orientation of the individual so that energy will be expended in one kind of activity rather than another.

The chemical determinants of behavior are of two main kinds. First, there are the external chemical stimuli which motivate behavior as do all other external stimuli by acting upon the receptors. The main chemoreceptors are on the tongue or in the nose. Second, there are internal chemical factors which act upon receptors or nerve cells. They may either excite behavior directly or predispose the organism for a particular kind of response.

There is evidence that the internal chemical state of the rat regulates to some extent his selection of foods. Richter has shown in self-selection feeding experiments that rats are able, within limits, to select and balance a diet according to their metabolic needs. He has produced evidence to show that when a specific substance is needed to maintain homeostasis the taste buds become more sensitive to the presence of that substance.

Again, in the sphere of sexual behavior it is known that the gonadal hormones regulate not only bodily growth but also the patterns of sexual behavior. For example, if the testes and ovaries of chicks are transplanted, the animals bearing the testes (regardless of their original sex) develop the physical characteristics of the male and the masculine patterns of behavior; the animals bearing the ovaries develop the female form and feminine behavior. The gonadal hormones are more important determinants of sexual behavior than any assumed difference between the sexes in neural structure.

Chemical motivation is of basic importance. From the genetic point of view there is some evidence to indicate that it develops prior to motivation through external stimulation of the receptors. Coghill (6) has shown that rhythmic contractions in the embryo toadfish can be accelerated by an increase in the concentration of carbon dioxide in the environment before any response can be evoked through the receptors. The behavioral change is produced by direct internal chemical action.

Psychological hedonism. After considering the physical and chemical determinants of behavior we must make a big jump in turning to the subjective aspect of experience. The entire subjective aspect—including conscious purposes, desires, feelings—cannot be considered for want of space. But brief consideration is given to the ancient doctrine of psychological hedonism.

In its simplest form the doctrine of psycho-

logical hedonism is the proposition that subjectively pleasing activities tend to maintain themselves and to be repeated; subjectively unpleasant activities tend to be avoided and eliminated from behavior.

Hedonistic psychology is implied in the law of effect. In Thorndike's first statement satisfying activities were said to be "stamped in" and annoying activities to be "stamped out." There was the same implication in the older pleasure-pain theory of learning. Hedonistic psychology is implied, also, in the modern analysis of interests and aversions as well as in the current analyses of happiness in relation to marital or other adjustment.

Although interests and aversions can be described objectively in terms of acceptance-rejection or continuance-avoidance of an activity, the fact remains that for most persons an interest is an activity which is subjectively pleasing and an aversion one which is displeasing.

Troland (24) admits pleasantness and unpleasantness as primary subjective data. He states that the problem of motivation is a psychophysiological one. After analyzing hedonistic theories of motivation and classifying them as hedonisms of the past, the present, and the future, Troland accepted a hedonism of the past. By this he meant that previous experiences of pleasantness and unpleasantness were actual factors in determining an individual's psychological structure; hence they regulate contemporary behavior. The theory has not won wide acceptance probably because subjective psychology has been under suspicion.

Holt (10) has faced the problem from an objective point of view. He coined the terms *adience* and *abience* to designate the reactions of acceptance and rejection. There is no doubt that adient and abient behavior can be analyzed objectively and in a quantitative manner. The conditions which determine it can be studied. But at the present time we do not know why some activities are adient and others abient.

A great many human activities have no apparent biological utility. They are said to be carried on just for fun, for the enjoyment they bring. A business man carries on his hobby—golf, hunting, stamp collecting—just for fun and relaxation. An artist enjoys colors and forms even when there is little meaning to the product of his art. A child plays, observes, explores, manipulates, vocalizes—just for fun.

The attempt to show that all of these activities are supported by the primary biological drives is futile and misguided. A good many psychologists, however, hesitate to admit that pleasant and unpleasant feelings motivate behavior. The difficulty can be stated in this manner: Behavior can be described as physical movement. The motivation of behavior, from first to last, is a physical process. Pleasantness and unpleasantness are subjective data. By definition they are mental, not physical. Hence, these feelings cannot motivate human behavior.

The argument implies a misconception. The facts of human experience, whether reported from a subjective or an objective point of view, are the ultimate data upon which analysis of human motivation must rest. Pleasant and unpleasant experiences, directly reported, are among the *givens* to be explained. Ultimate explanation in psychology must take account of all the facts, including subjective data.

As a temporary expedient the present writer suggested a doctrine of *factual hedonism*. This is not a theory of motivation. It is merely a frank recognition that pleasant feeling as a *fact* is associated with activities that tend to continue and be repeated as well as with the relief which comes with success and the making of a goal-response; and that unpleasant feeling as a *fact* is associated with activities that tend to be avoided as well as with frustrations, conflicts, and failures. Factual hedonism leaves open the door to further investigation.

Dynamic psychology. The history of psychology is replete with hypothetical systems for explaining human behavior in terms of instincts, propensities, wishes, wants, desires, needs, forces, and tensions. These systems differ widely from each other; scarcely two of them agree. A recent example is the system of Murray (17). He has worked out an elaborate system of human needs. The primary needs are viscerogenic; they are the same as the commonly recognized biological drives. The secondary needs are psychogenic; of these Murray lists twenty-eight, including such needs as acquisition, construction, dominance, blame-avoidance, and play.

Lewin (14) has assumed internal motivating tensions which have their outer counterpart in positive and negative behavior. The objects in an individual's environment are said to have positive or negative valence according to whether

the individual behaves positively or negatively with respect to them. Lewin has drawn an important distinction between manifest behavior and underlying motivation. Two patterns of behavior may be similar in form (phenotypically similar) but different in motivation: A friendly manner may conceal the determination to carry out an aggressive act or to destroy; the overt behavior resembles that of a true friend but the motivation is different. Again, two patterns of behavior may be different in form but similar in motivation (genotypically similar): A man under tension to mail a letter may relax this tension by handling the letter to a postman, putting it in a letter box, or asking a friend to mail it.

The work of Lewin has a definite relation to the dynamic psychology which has developed largely through the influence of psychoanalysis. Space does not permit an elaboration in this area but the following terms are listed merely to suggest important dynamic principles: *identification, projection, rationalization, compensation, repression, regression, substitution, self-defense, frustration-aggression, dissociation*. These terms suggest a dynamics of human behavior of which the individual, to a considerable extent, is not conscious.

In this connection a final word may be added about psychosomatic medicine, a contemporary development within dynamic psychology. The emphasis in psychosomatic medicine is upon the individual as a whole. He is regarded as a unit and not a mind plus a body. From this point of view it is clear that frustrations and conflicts may have physical symptoms and that attitudes and motives may affect both behavior and conscious experience.

The present writer believes that a monistic psychology such as that we find in psychosomatic medicine is required to bring together into a single theory of motivation the diverse facts and principles briefly outlined above.

For further study of motivation see the articles on attitude, emotion, experimental psychoanalysis, experimental psychopathology, frustration-aggression hypothesis, interest, and work. For general orientation see *Motivation of Behavior* by Young (28) and the article, entitled *Motivation*, in Monroe's *Encyclopedia of educational research* (29).

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MULTIPLE FACTOR ANALYSIS.—

This is a technique for determining, by the statistical analysis of a set of intercorrelations among a number of tests, whether a few elements run as common factors through all the tests; and, if there are such common factors, with what weight each of the tests is loaded with each of the factors. For example, the "intelligence" measured by the so-called intelligence tests may be a combination of more fundamental abilities such as the ability to generalize inductively, to interpret verbal symbols, to work with numerical concepts, etc. The several available instruments may test these different components to varying extents. By bringing together measurements from a number of such tests by means of the coefficients of correlation between them, and suitably analyzing this set of intercorrelations, it is possible to determine how many factors, if any, are common to the tests, and to what extent each test is potent for measuring each of the common factors (that is, is "loaded" or "saturated" with each factor). Charles E. Spearman opened this sort of inquiry in England near the beginning of the present century, taking the intercorrelations in com-

binations of four by the so-called "tetrad difference method," in which he tested the hypothesis that only one factor might be common to all the tests. In present practice all the intercorrelations are investigated together and the hypothesis of either one or more common factors is investigated simultaneously.

It is customary to carry the treatment of this topic in terms of the geometry of n -dimensional space. But in this article we shall first give an exposition of the technique in analytic terms only (that is, algebraic terms), because that form is much simpler for the reader who is untrained mathematically. Thereafter we shall relate this approach to the conventional geometrical one.

II

Probably all, or nearly all, human abilities rest upon a number of constituent elements or "determiners." The same thing is true of all sorts of traits, whether dynamic psychological characteristics of persons, or tendencies toward certain entelechies or responses on the part of plants or animals, or the operation of social institutions. Where learning is possible, as it is where individual or social human or animal behaviors are involved, these elements tend, as the learning proceeds, to get integrated into consistent patterns which express themselves in techniques of behavior. If some of the same elements enter as components in each of two performances (when we use this term to include the attainment of physical characteristics as well as the expression of human or animal abilities), measures of the two performances in a set of subjects will be correlated in the technical sense of that term, the coefficient of correlation expressing the degree of overlap by reason of the common elements (7, pp. 120-123). For the sake of simplicity of language we shall henceforth call any instrument for measuring performance a "test," and the number of units of a variate that any individual is found to exhibit when measured by a test we shall call his (or its) test score. We can determine whether there is an element common to two traits (or a set of common elements cohering consistently through our sample) by ascertaining whether there is a coefficient of correlation that departs from zero between the scores on these traits when each of N individuals is tested in both of the traits. Conversely, if the two

tests are correlated by an amount that differs from zero, that fact gives evidence of an element, or a coherent set of elements, common to the two.

When we have a set of intercorrelations differing from zero from a plurality of tests, they give evidence that the measured traits overlap. But we do not know by direct inspection whether the elements that produce the correlations are common to all of the traits or whether different elements are common to the different pairs. There are four possibilities:

1. Each correlation coefficient may be due to an element common to only its pair of traits.
2. One common element may run through all of the traits.
3. Certain elements may be common to groups of traits but not to all of them.
4. Possibilities 2 and 3 may both be realized.

It is the purpose of multiple factor analysis to get an answer to the questions posed by these four alternatives. It is, in other words, the object of multiple factor analysis to ascertain how many (usually independent) factors, either common to all of the tests or to groups of them, are needed to explain a set of intercorrelations; and to ascertain the degree to which each of the tests from which the intercorrelations arise is saturated ("loaded") with each of the factors.

Consider a series of tests designated a, b, c, \dots, n respectively. Let their scores be in standard form; that is, $z_1 = x_1/\sigma_1$. And let there be running through the intercorrelations common factors designated by the subscripts 1, 2, 3, \dots, r . If we assume only rectilinear relations (as we must since we are dealing with Pearsonian coefficients of correlation), we can express an individual's total standard score on test a as the sum of his standard scores on the several factors, each weighted by the test's loading in these respective factors:

$$z_a = a_1z_1 + a_2z_2 + a_3z_3 + \dots + a_rz_r \quad (A)$$

Similarly, his standard score in test b is

$$z_b = b_1z_1 + b_2z_2 + b_3z_3 + \dots + b_rz_r \quad (B)$$

In order to simplify the concept and the procedure we set the condition that the factors we are seeking shall be independent (that is, uncorrelated, another term for which is "orthog-

onal"). If, now, equations (A) and (B) are multiplied together, summed for the N individuals of the sample, and divided by N , terms of the form $\sum z_i z_j / N$ will equal 1 because each is the variance of a set of standard scores, and those of the form $\sum z_i z_j / N$ ($i \neq j$) will approach zero because they are the correlation coefficients between the factors which, by hypothesis are all zero; and $\sum z_{a1} z_{b1} / N$ is r_{ab} ¹. We shall then have:

$$r_{ab} = a_{1b} + a_{2b} + a_{3b} + \dots + a_{rb} \quad (C)$$

By intermultiplying the equations from all the tests we get n^2 equations, one from each of the intercorrelations, $n(n+1)/2$ (including those of the form r_{k1k1}) being different from one another as:

$$\begin{aligned} r_{aa} &= a_{1a} + a_{2a} + a_{3a} + \dots + a_{ra} + \dots \\ r_{ab} &= a_{1b} + a_{2b} + a_{3b} + \dots + a_{rb} \\ r_{ac} &= a_{1c} + a_{2c} + a_{3c} + \dots + a_{rc} \\ r_{ak} &= a_{1k} + a_{2k} + a_{3k} + \dots + a_{rk} \end{aligned} \quad (D)$$

We may continue to set up corresponding equations for r_{bb} , r_{cc} , etc., where the subscript i stands for each of the tests in turn. These equations must all be true simultaneously. Hence we have the familiar (but often intricate) job of solving a set of simultaneous equations to find the unknowns, a_1 , a_2 , b_1 , b_2 , etc., which are the factor loadings of the several tests.

Two types of methods have been used to solve this set of simultaneous equations.² In the "centroid method," devised by L. L. Thurstone, a solution is sought that will make the *sum of the factor loadings* a maximum. The alternative type of method, popularly known as the Hotelling "Method of Principal Components," but employed even earlier in slightly different forms by Thurstone and by Kelley, maximizes the *sum of the squares* of the loadings. Contrary to the widespread belief that these are basically different, rival methods, the essential difference between the two types of procedure is the simple one just mentioned.

¹ Some factorists sum through the whole population instead of through the sample, in which case $\sum z_i z_j / N$ must be replaced by $\sum z_i z_j$; they must then work in terms of the coefficients of correlation "corrected for attenuation."

² We shall not consider here the tetrad difference method, devised by Spearman, which was historically the precursor of the present multiple factor methods. If the reader is interested, he may look it up in references 5, 7, and 8 listed at the end of this article.

For the solution by first moments (the "centroid" method) we sum the terms in the simultaneous equations by columns. This results in the equation

$$\sum r_{1j} = \sum k_1^2 + \sum k_2^2 + \sum k_3^2 + \dots + \sum k_r^2$$

where $\sum r_{1j}$ is the sum of all of the intercorrelations (each entered twice except those of the type r_{11} which enter only once each), $\sum k_1$ is the sum of the first factor loadings in all the tests (which is squared *after* summing), $\sum k_2$ is the sum of the second factor loadings in all of the tests, etc. But this is an indeterminate equation; it contains r sets of unknowns and only one equation. We can solve it only by imposing enough conditions to reduce the number of unknowns to the number of equations. That is, we must impose $(r-1)$ conditions where r is the number of factors. And we must impose such conditions as will make the remaining unknown for which we are seeking a solution a maximum. So we impose provisionally the condition that each of the terms in $\sum k$ shall be zero except the first. This automatically maximizes $\sum k_1$ and permits us to get a solution *subject to this condition*—a condition which can later be revoked if we choose. It is not appropriate to give here a detailed account of the method, but the reader can find it explained and illustrated in a number of places (Ref. 2; 7; 9, ch. II; and 10, ch. III, and Appendix 1). After provisional loadings have been found for the first factor, a table of residual correlation coefficients is determined and, by imposing $(r-2)$ conditions like those for the first factor, a set of provisional loadings is found for the second factor. The solution continues in this manner until all significant factors have been isolated.

The "principal components" (Hotelling) method seeks a solution that makes the sum of the squares of the factor loadings a maximum. For this purpose an expression for the sum of the squares of the loadings is set up and partial derivatives of it are taken and each partial derivative equated to zero. This yields $(n+1)$ equations where n is the number of tests and also the number of factors, so that there are as many equations as unknowns. Hence the set of simultaneous equations is capable of a unique (that is, a single) solution. But when the determinant is evaluated in which the coefficients in the equations are set up for solution it yields a

"characteristic equation" of the n th degree; that is, with exponents running up as high as n . No general method is available for solving an equation of high degree; such equations must be solved by approximation methods. One resort is, therefore, to variations on a scheme of guessed multipliers devised by Sir Isaac Newton some 250 years ago which causes the trial roots to converge rather rapidly to a close approximation to the true ones. Hotelling devised an ingenious method of this type which permits approximation to the roots by a series of multipliers applied directly to the coefficients of the correlation matrix. This is the so-called "iterative" method. In this manner the largest root of the characteristic equation is obtained to a close approximation.

After the first factor loadings have been thus determined, tables of residual correlation coefficients are derived just as in the centroid method, and subsequent factors are isolated by the same technique as that employed for the first one.

Both methods give usually all positive loadings in the first factor and, in each of the subsequent factors, about as many negative as positive loadings. In fact, the matrix of factorial loadings before transformation (a term to be explained in the paragraph third below this one) are very closely alike from the two methods, particularly the first several factors. Table I gives the factorial matrix (table of factor loadings) before transformation from a problem devised by the author of this article to illustrate, and test the validity of, the process of multiple

factor analysis. These loadings were obtained by the centroid method. The values in parentheses are the known true values. These loadings for the first factor correlated .998 with the ones obtained by the Hotelling method for the same factor, although the mean loading by the Principal Components Method was a little larger than that by the Centroid Method. This particular coefficient of correlation was somewhat higher than would usually be obtained, but the agreement is regularly very close; and it is also a regular finding that the amount taken out in the early factor loadings is slightly greater by the Principal Components Method than by the Centroid Method.

We return now to the stage where, in the Centroid Method, we provisionally imposed sufficient conditions upon our otherwise indeterminate equation to permit us to get a solution. In the equation

$$\Sigma r_{1j} = \overline{E}k_1^2 + \overline{E}k_2^2 + \overline{E}k_3^2 + \dots + \overline{E}k_r^2$$

we imposed the condition that $\overline{\Sigma}k_2^2 + \overline{\Sigma}k_3^2 + \dots + \overline{\Sigma}k_r^2$ should be zero. That enabled us to get a solution, but it had the effect of throwing back into the sum of the first factor loadings all the excess of positive loading above zero from all of the remaining factors. Hence the first factor loadings as they stand after this provisional solution contain, in a sense, all the others.

That this is true is indicated by the analytic consideration mentioned above, and is further evident from consideration of what is indicated in the geometrical picture of passing the first axis through the centroid of the system. But this interpretation is also subject to verification by empirical test. The author of this article set up a matrix of intercorrelations based on penny tossing in a manner that would precisely simulate the conditions to which factor analysis methods are applied, with known factor loadings, and then factored the matrix, the results being those shown in Table I. If the above hypothesis is correct, that the first factor includes all of the succeeding ones, and each next factor includes all that follow it, the first factor should, before this combination of elements is separated by transformation, correlate low with the corresponding known weightings because the correlation coefficient turns on the per cent of elements that the two correlated arrays have

TABLE I
A MATRIX OF FACTOR LOADINGS
BEFORE TRANSFORMATION
(Known true factor loadings in parentheses)

Test	Factors			
	1	2	3	h
a	+ .842(.8)	-.359(.3)	+.079(.1)	.844(.74)
b	+.517(.7)	-.373(.0)	-.124(.1)	.422(.50)
c	+.612(.3)	+.027(.3)	+.043(.3)	.377(.27)
d	+.719(.3)	+.261(.4)	-.237(.6)	.641(.61)
e	+.702(.5)	+.103(.4)	-.233(.3)	.558(.50)
f	+.790(.6)	+.063(.3)	-.244(.5)	.688(.70)
g	+.863(.7)	-.248(.4)	+.050(.3)	.809(.74)
h	+.882(.7)	+.142(.5)	+.067(.3)	.803(.83)
i	+.623(.4)	+.086(.5)	+.267(.0)	.467(.41)
j	+.481(.2)	+.213(.6)	+.314(.0)	.375(.40)

in common, which per cent would be low if extraneous other elements were present and high to the extent that the impure array was purified by the separation out of these extraneous elements. Each succeeding column of factor loadings should correlate more highly with the true loadings because each has extraneous to itself only those beyond it. The coefficients of correlation between the untransformed loadings of Table I from our trial problem and the corresponding true ones behaved in precise conformity with that hypothesis: in factor 1 the r was .63; in factor 2, .70; and in factor 3, .78.

So in order to untangle the factors which are embedded together in the first one, and to a decreasing extent in each succeeding one, the provisional condition originally imposed is lifted and alternative conditions are imposed. The loadings in the factorial matrix are interrelated in the form:

$$\begin{aligned} a_1b_1 + a_2b_1 + a_3b_1 + \dots &= k_1 \\ a_1c_1 + a_2c_1 + a_3c_1 + \dots &= k_2 \\ b_1c_1 + b_2c_1 + b_3c_1 + \dots &= k_3 \end{aligned} \quad (E)$$

where the k 's are constants. Since the values for a_1 , b_1 , etc., are all provisional, determined merely by the condition imposed to get the tentative solution, any other value that serves our purpose may be substituted for any one of them, whereupon all of the others in the interdependent system will need to take on changed values so as to keep the system of equations consistent. Thus the system can be put through a transformation into another which completely satisfies all of its fixed conditions. The transformation must involve at least two columns of the factorial matrix but it *need* not extend beyond two at a time. But whenever a new value is substituted for any one of the test loadings within the two columns involved in the transformation at any one time, all of the others must follow along as dependents, since the elements are all interrelated. Simple equations for effecting these transformations are available (7, p. 266). The transformations are usually carried along by pairs of columns (although they can all be carried simultaneously [11]) until a satisfactorily meaningful form is attained, out of the infinite number of different forms that would be possible.

If it were only possible to know the true factor loadings of one of the tests, the worker could make these known loadings the point of

departure and obtain a unique solution. In the absence of any such guidance, the resort must be to certain criteria of plausibility and usefulness. It is not plausible that loadings should extend below zero because such a fact would mean that the possession of the "ability" measured by the test is a handicap to the subject. So one useful criterion is to raise the factor loadings so that they will all be positive (except for the possibility of a few small negative ones which can be charged to errors of sampling). In Table I this may be achieved in respect to column 2 by setting its lowest loading (-.373 for test b) equal to zero and effecting the consequent transformation by the formulae of reference 7 mentioned above. Then other transformations can be made until the "positive manifold" shown in Table II is attained.

TABLE II
MATRIX OF FACTOR LOADINGS AFTER
TRANSFORMATION

(Known true factor loadings in parentheses)

Test	Factors			h^2
	1	2	3	
a	+ .744(.8)	+ .201(.3)	+ .501(.1)	.845(.74)
b	+ .619(.7)	.0 (.0)	+ .200(.1)	.423(.50)
c	+ .401(.3)	+ .380(.3)	+ .270(.3)	.378(.27)
d	+ .491(.3)	+ .632(.4)	.0 (.6)	.641(.61)
e	+ .558(.5)	+ .494(.4)	+ .042(.3)	.557(.50)
f	+ .647(.6)	+ .513(.3)	+ .078(.5)	.688(.70)
g	+ .716(.7)	+ .303(.4)	+ .452(.3)	.809(.74)
h	+ .521(.7)	+ .631(.5)	+ .364(.3)	.802(.83)
i	+ .270(.4)	+ .434(.5)	+ .454(.0)	.467(.41)
j	+ .080(.2)	+ .454(.6)	+ .403(.0)	.375(.40)

The three factors in this particular problem have now been untangled; they are comparable with one another in a meaningful way, and they are now in close agreement with the known true weightings. They now correlate with the known loadings as follows: factor 1, +.84; factor 2, +.73; factor 3, -.72.

It has not been customary to transform the system of factor loadings obtained by the Method of Principal Components, because, having been obtained by the method of least squares, the first solution is unique. It is said that, if they were transformed, they would no longer be the principal components (9, p. 78)—that is, projections on the principal axis of an ellipsoid.

But, as both their close agreement with the factors obtained by the Centroid Method would suggest, and as consideration of the image of ellipsoids of equal density in n -dimensional space would reveal, each earlier one in the series does contain enmeshed within itself all that follow, just as in the Centroid Method; and they need to be untangled if they are to be maximally meaningful. There results from the Principal Components solution the same type of system of interdependent equations as shown at (E) above, although the particular values are a trifle different from those by the Centroid Method. From the analytic standpoint this system of interdependent equations can be put through transformations as legitimately as those from the Centroid Method. If the geometrical picture as ellipsoids of equal density does not lend itself as well to this as Thurstone's geometrical picture of an r -dimensional spheroid, that seems to indicate a certain infelicity in the geometrical representation rather than a reason why the transformation should not be carried through analytically.

III

If the reader of this article has had any previous contact with the literature on multiple factor analysis, he will not recognize the above account. That is because our account has been carried wholly in analytic (that is, algebraic) terminology, while the conventional treatments of this subject have nearly all been in terms of the geometry of n -dimensional space. As a matter of fact, practically every argument in mathematics can be carried in either analytic or geometrical form, or by an interplay between these forms, with identical outcomes and with identical meaning. Indeed, in the original articles on multiple factor analysis the basic derivations are usually carried analytically and are then translated into geometrical pictures that they "may be regarded as." There is no ramification of this subject that has a mathematical basis which cannot be developed and expressed analytically, just as there is also no ramification of it which cannot be conceived in geometric imagery. And the same is true of mathematical arguments with other types of subject matter. For example, if we have an equation in x of degree n and can know, by solution or by assumption, one root, a , then the equation can be divided by $(x-a)$, whereby its highest expo-

nent is reduced to $(n-1)$. This equation can be conceived as plotted in space of n dimensions and a plane representing the condition $x = a$ can be passed through the configuration, whereupon the resulting hyperplane has its dimensionality reduced to $(n-1)$. A correlation coefficient, which is analytically expressed by $\Sigma xy / N \sigma_x \sigma_y$, can also be put as the cosine of an angle between vectors in space of N dimensions where N is the number of pairs of subjects tested. Where n is the number of tests, correlated tests as wholes can be posited in an n -dimensional spheroid in positions determined by vectors which connect them with the center of the system and which have their directions determined by the fact that the cosines of the angles between pairs of them equal the intercorrelations; or they can equally legitimately be represented by a matrix of intercorrelations in arithmetic form. Parallelism between the analytic procedure and the geometrical may be well illustrated by the process of transforming factor loadings. As said above, we have in the factorial matrix expressions of the type

$$a_1 b_1 + a_2 b_2 = k_2$$

which we may analytically transform to

$$a_1' b_1' + a_2' b_2' = k_2$$

But any expression of this form, no matter what the nature of the subject matter so long as each of the elements lies between plus and minus 1 and k_2 is a constant, can be put into trigonometric form. For if $a_1 = \cos x$, $b_1 = \cos y$, $a_2 = \sin x$ and $b_2 = \sin y$, the expression becomes that for the cosine of the difference between angles x and y . So whenever one of the elements, say $\cos x$, is set to conform to an imposed condition, all the other three dependent ones are determined. So the transformation can always be represented in space and performed by the manipulation of angles between the fixed vectors and the movable axes as a process of rotation just as feasibly as it can be handled by algebraic means, and with identical outcomes. Here x and y are the angles made respectively by the two test vectors with the axis, while $(x-y)$ is the angle between the vectors, which is constant whatever the position of the axes.

When the process of transformation of factor loadings is carried in geometrical form as a process of rotation, the ideal to be achieved by

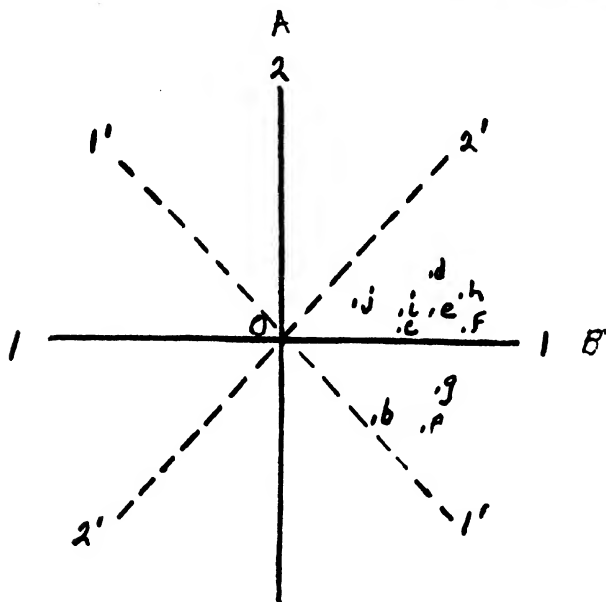


FIGURE 1. Factor loadings for columns 1 and 2 plotted. Solid lines are axes before rotation; broken lines, after.

the rotation is expressed in two optima: (1) a positive manifold; (2) simple structure. For two factors the geometrical picture can be drawn on plane paper with two perpendicular lines representing the orthogonal axes. The first of these optima would be fulfilled if the axes could be so rotated that none of the tests would fall outside of the quadrant AOB; the second, if most tests fell on the boundary lines rather than somewhere within the quadrant.

For three factors the representation must be on a sphere, with the tests projected to the surface by "correction for uniqueness." If there is a positive manifold, none of the points representing the tests will fall outside of a spherical triangle (a right spherical triangle if the factors are "orthogonal"); if there is simple structure, they will fall on the sides of this spherical triangle rather than within it. The intersections of the hyperplanes passing through the vectors of the tests which lie along the arcs in simple structure determine the "primary trait" vectors; to the extent to which tests lie not only along

the sides of the triangle but near the vertices, to that extent these tests are relatively pure measures of the "primary abilities." An analogous arrangement holds as we pursue the case of four or more factors into space of four or more dimensions. All of these criteria have their exact counterpart in analytic form; and the extent of attainment of each can be observed by merely inspecting the transformed factorial matrix. We have a positive manifold if all of the loadings in all of the columns have the positive sign, or if the negative values are so small that they can be attributed to errors of sampling; we have simple structure if in each row there is at least one zero and preferably more; and we have relatively pure tests of primary abilities if, in the several columns, the loadings are heavily concentrated in one, or a few, tests while the other tests in their respective rows have zero or low loadings. These simple relations hold for the case of independent factors; when (and if) the transformations are not orthogonal, the matter becomes much more complicated.

IV

The Chicago school in particular has held high hopes that we could find primary abilities by the optimum selection of tests and the optimum rotation of axes. This hope is predicated on the belief that there are real independent abilities rather than mathematical artifacts which multiple factor analysis can isolate. This has led them not only to search diligently for just the right position of the axes, so that the traits could be identified as familiar ones, but also to the expedient of "oblique axes." That is, if the geometrical picture reveals that we might get more nearly simple structure by letting our axes sag away from perpendicularity (that is, by not imposing the assumption of independence of the factors), we may do so and determine our loadings with the admission of some correlation among them. In fact, this is the general case. Multiple factor analysis does not necessarily assume that the primary factors are uncorrelated in the general population, although it usually (though not necessarily) sets up an orthogonal reference frame for simplicity in solving the fundamental equations to get the original arbitrary loadings. From those orthogonal reference frames the members of the Thurstone school rotate the axes into any positions which seem best to identify the primary abilities they are seeking, including positions in which the axes are related by oblique rather than right angles.

But time may well prove that the hope of finding many important primary abilities, fundamental and invariant from test battery to test battery, is a vain one. We can, however, fix certain "cores" which are uncorrelated and which can be used conceptually to describe a complex of behavior as exhibited in a set of tests. In most cases we may not be able to name these perfectly by any of our conventional labels. For any name that we can use will include more than the factor, since practically any trait of which we know the name in life is a compound of "a man's successive performances or behavior as integrated throughout the duration of his life" (1, p. 237); and also one which is likely to center in its connotation somewhat off of the point isolated by our mathematical processes. A corresponding difficulty, plus some serious additional ones, will be encountered when we attempt to make pure tests for measur-

ing the isolated abilities. MacKinnon (4, p. 35) has expressed this point of view as follows:

The more scientifically sophisticated factorists think of factors as *systems of coordinates*, as simple and parsimonious frames of reference for the classification and interpretation of the underlying variables of personality. For them, factors are not faculties or traits existent in concrete personalities, but rather convenient descriptive categories which enable the factorist to generalize and simplify test results and make predictions about people with a maximum degree of efficiency. (See also Ref. 1, p. 237.)

The most extensive application of multiple factor analysis has been to the analysis of psychological tests. But it can also be applied to the analysis of persons (1, ch. 6), and each person's ability in each of the isolated factors can be expressed in an equation and calculated. The technique has been applied to the analysis of newspapers and could be applied to many other sociological data. It should also be applicable to problems of production and of growth in agriculture and to problems of nutrition and health of human beings as well as to other medical problems. But it must not be supposed that it can replace the older technique of multiple regression where prediction of a criterion, and the analysis of the components of a team of factors in relation to a criterion, are at stake. Multiple factor analysis is useful where a plurality of measurements suggests a functional unity but in which there is reason to suspect more elementary components, and it is desired to ascertain how many such components are required to account for the intercorrelations resulting from the measurements and to study the nature of these components. Multiple regression is useful where it is desired to predict a criterion with maximum effectiveness and to study the net weight of each of the constituent elements in the team for predicting the criterion.

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N

NATIONAL COUNCIL OF WOMEN PSYCHOLOGISTS, THE.

—During the fall of 1941, a group of New York City women psychologists met several times to discuss the feasibility of a national organization of women psychologists to participate actively in the nation's emergency and war effort. Already during annual meetings of the national psychological associations, when the rumblings of war were first audible, women had considered phases of such participation, as it seemed that even though specialists they would not be included in the various types of psychological work in connection with selection and placement in the armed forces of the country—perhaps of necessity then. However, since there were undoubtedly many types of professional services to the community in wartime which women psychologists might undertake, and ways of serving their country professionally, a steering committee was formed at a meeting in New York City in December, 1941, to proceed with the details of a national organization.

All women psychologists in this country who were qualified for membership in such an organization under the terms of a constitution drawn up by the Constitutional Committee, of which Dr. Ella Woodyard was chairman and Drs. Alice Bryan and Gladys Schwesinger members, were invited to become charter fellows of the National Council of Women Psychologists. Within the prescribed time 234 women, fulfilling the requirements, including the Ph.D. degree in psychology, had accepted this invitation. A slate of officers prepared by a Nominations Committee consisting of Dr. Clairette P. Armstrong, chairman, with Drs. Helen Richardson and Mildred Mitchell members, was sent to each fellow to be voted on, together with the proposed constitution. By June, 1942, the National Council of Women Psychologists was functioning widely under Dr. Florence Goodenough, president; Dr. Helen Peak, vice-president; Dr. Theodora M. Abel, treasurer; Dr. Gladys Schwesinger, secretary, and eight board members, Drs. Marion Bills, Alice Bryan, Ed-

wina Cowan, Florence Mateer, Myrtle McGraw, Harriet O'Shea, Ruth Tolman and Dorothy Van Alstyne. There were 261 members by January, 1943.

The NCWP constitution and by-laws were adopted by more than 80 per cent of the members except for one clause which referred to disbanding after the war. Some thought such an organization could be useful in peacetime or that the post-war situation should guide future action, although the stated aim, namely of developing the services which properly trained women psychologists can perform in community and nation in time of war, stood approved.

At the first NCWP board meeting held by Dr. Goodenough in New York City July 29, 1942, representatives of three local units were present and petitioned for recognition. Such units were provided for by the constitution, to be subsidiary to the national body and operative under its laws. At this time were chartered the New York Unit, Rockland County (New York) Unit, and the Philadelphia Unit. A little later the Boston Unit was also affiliated. Local units planned to cooperate with the volunteer war emergency organizations offering assistance as psychologists. Each unit also held a number of meetings at which reports were given by psychologists of their activities in the various emergency organizations and plans for greater usefulness laid.

The largest unit, numbering fifty-one, in New York City, presided over by Drs. Armstrong, president; Barbara Burks, vice-president; Cecile Flemming, secretary-treasurer, and Alice Bryan, Emily Burr, Gladys Schwesinger and Ella Woodyard, board members, voted to admit to memberships auxiliaries with lower qualifications than the regular members, to work under their direction and assist on various projects. The New York Unit, having offered its services to the Civilian Defense Volunteer Office, was busy with plans to meet emergencies which might arise, especially if the war were carried to these shores. Dr. Myrtle Pignatelli was appointed representative to serve as a member of the CDVO

Advisory Committee on the Training of Volunteer Workers, which held monthly meetings at City Hall. In the days when warnings of bombings were frequently reiterated by officials, the Department of Training of the CDVO expressed appreciation of the professional services of the New York Unit, and some members were allocated as consultants to the different boroughs of New York to deal with special problems requiring psychological guidance.

The Rockland County Unit under Drs. Elaine Kinder, president, and Margaret Mercer, secretary-treasurer, soon decided that in view of their small number it would be more expedient to dissolve and join forces with the New York group.

The Philadelphia Unit, presided over by Dr. Mildred Sylvester, with Dr. Selinder McCauley, secretary, carried on a great deal of volunteer work predominantly in connection with the enrollment of the WACs.

The Boston Unit, led by Drs. Marie Rickers-Ovsiankina and Rosaline Goldman, secretary, appointed upon request special members for special jobs, such as interviewing WACs. There were also two active committees, one dealing with marriage counselling—war marriages and difficulties of the returning veterans and their families, the other with combating intolerance in children.

An NCWP Committee on Publications, synchronous with its beginnings, under the chairmanship of Drs. Dorothy Nyswander and Kathryn Maxfield, sponsored outlines for discussion groups and courses contributed by members, to assist in solving community problems. These outlines, though only mimeographed, were ordered widely. There has been an especially large circulation of Dr. Harriet Fjeld's "Training Leaders of Discussion Groups," which was used by such groups as the Boy and Girl Scouts, the Y's, etc. Dr. Ruth Valentine's "Problems of Youth," Dr. Ruth Strang's "Meeting Emotional Strain in School Teachers," as well as Dr. Roberta Crutch's "Teaching Babies to Eat: War Time Conditions," and "The Challenge of the War to Rural Citizenship," by Dr. Lillian Portenier, illustrate the diversity of topics. The outline of a course of six sessions on Psychological First Aid, devised by Dr. Jeanne Gilbert with the collaboration of Dr. Armstrong, was used for many classes of housewives by the former under the auspices of the Ameri-

can Women's Voluntary Services in Brooklyn, and by the latter for other groups in New York City.

Dr. Georgene Seward's Committee on Post-war Planning for Women carried on research, published findings and finally affiliated with the SPSSI Committee on Roles of Men and Women in Post-war Society.

NCWP has received requests from other associations, often women in other professions, for cooperation in their activities. Also inter-professional matters have claimed attention. The Emergency Committee in Psychology of the National Research Council in 1943 invited NCWP to elect a representative to this committee, and the board appointed Dr. Bryan, who recently reported that much of the work of the committee is still bound by wartime secrecy and will not be released publicly until after the war. Two delegates, Drs. Goodenough and Schweisinger, with Drs. Abel and Bills as alternates, were elected in 1943 to serve on the Inter-Society Constitutional Convention engaged in reorganizing the APA.

Because of the war emergency restriction on convention travel, the NCWP annual business meetings have usually had to be omitted and affairs conducted largely by mail. Regional meetings have been held by members residing in the environs, coincident with skeleton meetings of other psychological societies. In September, 1944, the vice-president, Dr. Grace Arthur, presided over an NCWP session to discuss various questions, at the time of the APA Cleveland meeting. In April, 1945, after the EPA meeting, President Armstrong conducted a business meeting at Columbia University, following a luncheon program at which Dr. Bills discussed "Psychologists as Personnel Directors in Industry"; Dr. Frances Triggs, "The Psychologist's Contribution to the Field of Nursing," and Lieutenant Mildred Mitchell described her work as psychologist in the Navy.

With the cessation of hostilities on the European front, the Philadelphia and Boston Units have disbanded. The New York Unit, guided by President Burr, has various projects on hand, particularly in connection with returning service women. The National still stands ready to render any assistance possible.

CLAIRETTE P. ARMSTRONG,
President, 1944-1945

NATIONALISM.—Nationalism is one of the most vigorously dynamic attitude patterns prevalent in the world today, being comparable in potency to the religious fervor of the Crusades. By virtue of its affinity for aggressive impulses, it is a powerful factor in modern wars (cf. War and Peace).

The extent to which nationalism is a generalized attitude pattern has been demonstrated by various investigators, e.g., Ferguson (2), Stagner (12), Murphy and Likert (10). In the United States it involves a considerable number of superficially unrelated elements, such as support of protective tariff and big armaments, hostility to communism, and defense of national honor. It would probably be misleading, however, to emphasize specific issues. At one time the nationalist may be found engaging in imperialist expansion, whereas at another stage in history he will favor encapsulated isolationism. The Russian nationalist obviously approves of communism, while the German Nazi abhors it. The one point which all nationalists have in common is a focusing of attention, drive and positive emotion on the symbols of the nation.

Characteristically, modern nationalism is featured by the delusions of national virtue, national grandeur and national persecution (Stratton, 14). Thus the German nationalist believes that his Fatherland has always played a cultured, progressive role in international relations, whereas persons holding other symbols dear have quite an opposite view. The German has delusions of grandeur, which often take the form of yearning for world domination; Britons and Americans prefer to daydream of prestige and power for their respective countries. The Nazi experiences delusions of persecution, which have an extraordinarily wide scope, including persecution of his mother country by Jews, Communists, Britons, and Frenchmen, among others from time to time. Most nationalists have their persecutory reactions, although these are most virulent in aggressive nations, formerly those known as the Axis.

These elements of the nationalist pattern are referred to as delusions because they are characteristically irrational. Like the delusions of the neurotic and psychotic, they ignore realities conflicting with the major tendency; facts are distorted and meanings twisted to support the nationalist thesis; positive fabrications occur in

the literature of all nationalisms, devised either cynically for the entrapment of the gullible, or unconsciously under the pressure of strong motivation.

The crucial questions, from the psychological point of view, regarding nationalism are: What are the dynamic factors which give it such extreme power in controlling behavior? What are the environmental factors which channel these emotional and motivational elements into the nationalist pattern?

Regarding the first of these, opinion seems agreed that two major considerations are involved: transfer of emotional value from parents to national symbols; and displacement of drives from personal to group goals.

It is intrinsically easier to demonstrate the relation of nationalism to parent attitudes than to demonstrate displacement of drives. The universal use of phrases such as "Fatherland" and "mother country" is an obvious cue. Psychoanalytic-minded investigators, such as Fairbairn (1), Hopkins (3) and Lasswell (7), have reported numerous instances of dreams and free association material revealing the intimate relationship in the minds of their subjects between parent and national symbols. From such clues we are led naturally to the child's delusions regarding the virtues and potency of his parents, which seem to furnish the prototypes for corresponding delusions relative to the nation.

In addition to this material of a qualitative nature, we find some recent statistical studies which confirm the thesis. For example, a study of college men who felt rejected by their parents, as compared with a matched group who felt accepted, showed a reliable difference in favor of the latter group as more nationalistic (Stagner, 13). Similarly, a comparison of nationalistic and internationalist college men revealed numerous evidences that the former group identified themselves with and had generally successful relationships with their parents, whereas the internationalists generally did not so identify themselves, and reported numerous instances of family conflict. On standardized attitude scales, nationalism was found to be negatively correlated with felt antagonism toward either parent.

Active radicals (Socialists and Communists) constitute a group whose antipathy to established national symbols needs no validation. Krout and Stagner (6) gave a lengthy question-

naire on family relations to a number of such young radicals, and to comparable conservatives. The radical group had a much larger number of points of conflict and unpleasant relationships with each parent. This has also been confirmed with standardized attitude scales (Stagner, 13).

The role of displaced personal drives is manifest in such phenomena as the drive for national expansion, prestige and power. The world's outstanding contemporary nationalist, Adolf Hitler, had revealed his identification of himself with the German nation in many passages of his speeches and writings. The classic expression of this attitude, of course, is ascribed to Louis XIV: "L'état, c'est moi!"

The normal development of the individual involves the canalizing of motivational energy (by whatever name) in the direction of specific goals of personal wealth, prestige or other values. In a certain number of cases, presumably because of blockages which have impeded this normal channeling, the goal adopted is the wealth or power of a group. This may constitute the advancement of a labor union, a political party, a church or a nation. The true patriot has identified his own welfare with that of the nation and deflects the energy he normally would expend on personal ambitions toward national goals. This is not, of course, to be confused with the case of an individual who makes use of the nation and the patriotic feelings of his fellows to further his purely selfish aims.

Many, if not most, citizens of modern nations carry frustrated desires for power within them. It is not surprising, therefore, that propaganda delineating a status of superiority has a potent appeal. Our mental hospitals are full of people who create grandiose delusions for themselves; such ideas are not dangerous because they relate only to isolated individuals. Hitler evokes dreams of national or racial superiority to satisfy his own inner needs; these dreams become menaces to world peace because so many less articulate persons find them emotionally gratifying.

As in the case of many psychotics, it appears probable that delusions of grandeur lead to the development of delusions of persecution. The discrepancy between the grandiose dream of what ought to be and the observable reality—if not blocked out by complete dissociation—must somehow be rationalized. So the Russians

develop delusions about a conspiracy of capitalist nations; the Nazis likewise about the western democracies and Russia; the Argentines about the U.S.A., and so on. These delusions serve the purpose of explaining the failure of one's nation to reach its promised greatness, and also to canalize latent aggression against the alleged persecutors. Also as in the psychotic, this mental device serves as an excuse for releasing an overload of pent-up aggression; if one is being persecuted, it is justifiable to attack. Thus nationalists never admit to waging wars of aggression; every war is one of self-defense. (*Vide War and Peace.*)

It is important, in connection with the mythology of nationalism, to emphasize certain irrational and unconscious aspects of the mental processes involved. These features are apparent in the violent emotion aroused by any criticism of the nation as such, attacks on national symbols, or attempts to "debunk" national legends. Any rational debate on the fundamental tenets of the nationalist mythology, particularly in wartime, stirs vigorously aggressive opposition.

Repression and rationalization are manifest in the literature of nationalism; patriotic feeling operates to suppress certain "facts," to distort others and to foster the fabrication of "events" when necessary. Some of the patriotic legends of World War I, investigated afterwards, proved to be pure invention; others were ingenious distortions based upon actual incidents. Under stress of emotion, some aspects of an occurrence are forgotten, others magnified and extended. The resulting tales, however, implausible, are widely accepted because they are satisfying to the recipients. History texts show ample evidence of the same phenomena.

As regards the environmental determinants of nationalism, it is obvious that the educational system plays a leading role. Horowitz (4) has demonstrated the gradual development of fixation on the symbols of the nation and some of the emotional aspects of this process. Meltzer (9) has shown the vague but menacing characteristics in young children's stereotypes of foreigners. Both of these investigators find reason to believe that the schools foster blind devotion to "our" nation, irrational dislike of other nations. Studies such as that of Pierce (11) have adequately demonstrated the preponderance of suggestions antagonistic to all foreign

countries in the textbooks to which school children are exposed. The speed with which totalitarian regimes begin to dictate the content of education is indicative of the recognition of the importance of the schools.

Newspapers and similar media of communication both follow and lead this tendency of public opinion. As Walter Lippmann once remarked, it is safe for the newspaper to denounce acts of foreign nations because the foreigner is neither an advertiser nor a subscriber. Movies need a villain; the foreigner is convenient for the purpose. Even radio serials for children show a predilection for such choices, presumably because the use of accent makes for distinctive vocal qualities. The cumulative effect of all these factors is suggested by Meltzer's study, in which school children characterized various foreign groups as "dirty, mean, cruel." It may even cling on into college, since the data of Katz and Braly (5) show many similar, if less intense, manifestations.

Nationalism is a major counter in political affairs in all nations. In the United States we are familiar with the office-seeker who habitually denounces foreigners and chants the praises of America for the purpose of avoiding debate on concrete issues. He uses—often successfully—the device of labelling his critics "un-American." This technique has been found effective in Britain and France—and was, of course, the outstanding characteristic of Hitler's speeches as candidate in Germany.

This propaganda of newspapers and demagogues would not stir such a profound response were it not deeply satisfying to many individuals. Propaganda is not magic. It cannot create motivational tendencies; at most it can direct them.

A representation of "our country" as opposed to and in conflict with other nations seems to be uniquely acceptable in the customary frame of reference. The process of polarization may be implicit in the development of percepts and concepts in the child. There seems to be some reason for believing that the establishment of one percept as "good" automatically constellates contrasting or opposing percepts as "bad." Thus the child's loyalty to one school facilitates disparaging opinions of competing schools; and one can observe similar reactions in his judgment of communities, churches and nations. Freudians find the basis for this phenomenon

in the ambivalence of the child's reactions to his parents; in the solution of the Oedipus complex, the negative emotional feelings regarding the parents are repressed and only positive emotions remain conscious. The negative affect is then presumed to become associated with individuals, groups or symbols outside the family. On the basis of traditional learning theory, it has been suggested (May, 8) that the favorable emotion predominantly associated with the family transfers to those institutions, groups and symbols which are experienced along with the family. In this view the negative value of foreign nations would have to be explained as a result of adult conversation, newspapers, and education. The intensity of the negative emotion often seems to go beyond this explanation, and to argue for the correctness of the Freudian viewpoint.

The potency of nationalism is the chief psychological barrier to the establishment of a world security organization for collective action against breaches of world peace. As long as the majority of the population in any Great Power has this blind loyalty and devotion to national symbols, including the delusion of national virtue, the people will rally behind leadership pursuing nationalistic aims in the face of opposition from the world organization. Nor will the people of other nations wholeheartedly support collective action except as they see the welfare of their nation directly involved, a condition rarely met in the early stages of aggression.

Many authorities have asked if world peace will ever be compatible with nationalism. The answer seems to be that patriotism, local pride and group cooperation are compatible with world unity if we can eliminate the aspects of aggressiveness and mutual suspicion. Religious fervor has in earlier times led Christians to battle Saracens, and Protestants to war on Catholics. Today religious loyalty is recognized as a desirable emotion, but it does not necessarily connote hostility to other church groups.

The future of nationalism must be similar. We must strive to achieve a frame of reference, for ourselves and for our children, in which nations are perceived as different but not necessarily hostile. We must educate our children for pride in their own social group and its valuable achievements, but also for tolerance and respect regarding the accomplishments of foreign lands.

The solution to the problem of national frontiers is not to exile all persons outside the majority nationality; it is instead to render boundaries less important, so that the exact location of the line creates little tension.

To end wars, we need not abolish nations. We may be able to merge them into an organization of cooperating equals, with certain powers centralized, as England and Scotland once ended their incessant struggle by accepting a single king. Achieving this purpose—true world organization—will require methods of child training, education and public communication drastically different from those prevalent in every western nation today.

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NEGRO, THE PSYCHOLOGY OF THE.—The belief that humanity has by nature been divided into races and subraces, and that certain races are inherently superior to others in psychological endowment forms the basis of the racial-difference hypothesis. Racial superiority has been attributed to a number of causes, but in any event the racial-difference hypothesis assumes it is of a permanent nature, resting upon fundamental native differences. An opposite view insists that any apparent differences in psychological characteristics are not biological but are due to culture and the social environment.

History reveals that the belief of racial superiority is very old and well-nigh universal. In recent years it has taken on such tremendous reality and practical significance for many racial groups that they will die in its defense. Moreover, outworn and forgotten racial theories have been revived in an attempt to rationalize political, economic, and social actions and policies. Outstanding among such theories, because of its wide popularization, is that developed in Gobineau's *Essay on The Inequalities of Human Races* (16) and subsequently expanded by Chamberlain (12). Its fundamental contention is the superiority of the white race, Caucasoid, over the other races, and the Aryans (of which the Teutons are regarded as the "purest representatives") over all other whites. The Aryans are the men of reason, honor, ideals, and the true builders of civilization. The black race, Negroid, is given to things of sense and passion; its members see better, hear better, and have a keener sense of smell, but they are capable of fewer of the higher mental processes. The yellow race, Mongoloid, possesses the traits which make for utility, order, and mediocrity. Because races are static and immobile, they cannot be changed. Any effort to mix them meets with disaster. Several writers in the United States have more or less followed Gobineau's pattern (20, 43). Grant (20), for example, glorified the Nordics (a branch of the Teutons), placed them in a class of Platonic guardians and regarded minority peoples as hopelessly inferior.

Opposing Gobineau's point of view are men like Finot (17) in France, Boas (6) and Klineberg (29) in America. In general, these men contend: first, that any differences in psychological qualities are not native or racial but are due to milieu; and, second, that the so-called

proof of inborn inferiority of any one racial group as compared with any other has usually been invented for political or economic reasons, or else is a belief which we naively take for granted.

STATEMENT OF THE PROBLEM

There are so many theories "proving" racial superiority, all in conflict with each other and based primarily on subjective judgment, that one becomes skeptical of their slightest validity. To claim essential racial equality on that account, however, would also be a prejudiced conclusion. Objective data themselves, not specious theories, must be examined.

A good definition of race is hard to give. This, however, is not our concern at the moment. On the contrary, we wish to discuss *The Psychology of The Negro*. Let us call it one aspect of the problem of proving true or false the racial-difference hypothesis. Granted some physical differences between the races, is it possible to find parallel differences in psychological characteristics which can be regarded as part of man's functional nature? Specifically, is there acceptable evidence tending to show a psychological endowment in the Negro race different from that of all other races? Does the Negro exercise functions which are not present in other races; i.e., are there psychological characteristics which are peculiar to the Negro? Does the Negro exercise some psychological functions to better advantage than other races? In short, are there innate qualitative or quantitative differences in psychological qualities between the Negro race and other races?

Some years ago Garth (19, p. 11) envisaged our problem thus as a scientific proposition. Given two races R_1 and R_2 ; an equal amount of education or nurture, E ; a psychological testing device, D , fair to both races; and (as amended by Dearborn and Long 15, p. 531) an investigator who is openminded or free from racial prejudice, O . This gives us upon measurement $R_1 E D O \cong R_2 E D O$. The formula looks innocent enough but in reality it is a poser. In it are the following factors which are difficult to control:

1. *Race*. In the first place we have the factors R_1 and R_2 , two races. We ask what is a race? Although physical anthropologists do not agree upon an exact definition of race, the following

statement would probably be accepted by most of them, namely, that race is a large subdivision of mankind the members of which are distinguished by possessing in common (a) certain distinctive *physical characteristics* which are (b) *determined by heredity* (29, p. 18). Only when both of these facts can be demonstrated do we have a true race. The physical characteristics which have been proposed and applied as criteria of race are many as, for example, skin color, hair texture and color, pigmentation of the eye, nasal form, stature, blood groups, facial and cranial measurements. The difficulty is that the complexities of these physical characteristics from one group to another are so great, and the individual differences within the same group are so tremendous, that no one race can be said to be pure. Whenever the concept is hereinafter used it will be enclosed in quotation marks to indicate that it cannot be applied except in the loosest sense. Some psychologists, e.g., Anastasi (1), take the view that "racial" classification is so difficult a matter as almost to preclude investigation of the problem of psychological differences between "races." For readable accounts of many of the difficulties of "race" classification, see Huxley and Haddon (25), also Herskovits (21).

Perhaps we should also stress the fact that as it concerns the American Negro, the word "race" is a sociological term. Herskovits (24) has shown that this group constitutes a population which is "probably less than one-fourth unmixed Negro descent" (pp. 10-18), and that the average American Negro is as far removed in respect to "racial" traits from the pure Negro type as he is from the average Caucasoid type. Yet old patterns of "racial" prejudice tend to persist, and those suspected of possessing the slightest strains of "Negro blood" are classified sociologically as Negroes.

2. *Sampling*. If one "race" is to be compared with another, the question of the degree to which any particular group can be taken as representative of the whole "race" to which it belongs becomes a matter of great importance. Should it consist chiefly of individuals whose abilities would be represented either by the upper or by the lower end of a distribution curve of the abilities of the "race," the results would lose much of their significance. We shall return to this problem later and demonstrate especially the danger of extending the results

from one sample of the American Negro to the corresponding population as a whole.

3. *Equality of Nurture.* A common culture implies, not only substantial conformity to tradition, religion, recreation, education, economic status, and the like, for all members, but also adequate participation in cultural opportunities. That the Negro, particularly the American Negro, is subjected to many shocking discriminations can be readily revealed by reading "The Negro in American Life Series" recently prepared under the general direction of Dr. Gunnar Myrdal (23, 26, 28, 35, 42) and sponsored by the Carnegie Corporation. Moreover, it must always be remembered (a) that comparisons are permissible only when environmental differences are absent or at least negligible (7, 9, 11), and, (b) that attempts to equate experimentally for social and culture inequalities of "racial" groups are open to serious question (10).

4. *Fair Measuring Device.* Psychological tests have been subjected repeatedly to criticism on the ground that they are unfair to some "races" examined. A test prepared by a Chinese psychologist would be a measure of what his culture and not a measure of what another culture regards as essential. Moreover, the Chinese would have a decided advantage over Americans in making scores on the test. This is obvious, but what is not so obvious, although none the less a fact, is that a subgroup within a nation such as the American Negro who has had inadequate participation in cultural opportunities will be handicapped in much the same way as one belonging to a wholly alien culture. Psychologists have tended to slight this circumstance because they readily make the erroneous assumption that all compatriots have an equal share in the cultural scheme.

5. *Open-mindedness.* It is difficult for a great many persons to consider the problem of "race" differences objectively since most people, no matter what their "race," have a quick and ready answer to the question regarding fundamental psychological differences. The problem enters into the study of the Negro in a very real manner because of the stereotyping process of both Negroes and whites. According to the popular stereotype or myth (23, 27), the American Negro is an individual of very low mentality. He is considered immoral, or else "unmoral," and is regarded as having criminal

tendencies, being physically unattractive, highly emotional, untruthful, boisterous, over-assertive, bumptious, lazy, happy-go-lucky, and "childish."

It goes without saying that "race" attitudes and judgments of this sort cannot throw very much light upon our problem and will color the results of an investigator who is not free of them.

6. Finally, there is the problem of *interpreting and evaluating the results.* The possible source of errors here is to be attributed mainly to certain assumptions made in the construction and administration of tests. It is *assumed* that the traits tested—for example, intelligence—are inherent; that is, they are not subject to training, and that the individuals who are tested possess *equal* opportunities for achieving. If the traits tested are wholly innate, and if the individuals are not handicapped or penalized by the mechanics of the tests and the test conditions, *then* we are justified in saying we have a fair method of attack. If consistent and reliable differences occur among "racial" groups under such test conditions, we are fairly safe in saying that they are "racial" in determination.

By the time corrections are applied to original measures for the above and other (29, pp. 152-299) factors related to the whole testing situation, the investigator may well wonder at their significance.

METHOD OF PROCEDURE

The problem has been approached in many different ways involving several different though not unrelated disciplines (29, 31). First, attempts were made to infer (or perhaps prove?) inferiority of the Negro by assessing relative contributions to culture or civilization. Then came efforts to find biological differences on the assumption that physical differences between "racial" groups implied psychological differences. Since about 1900 the scientific material has taken, increasingly, the form of psychological analysis through the method of objective tests. The present article is concerned with the last of these approaches and as the same has been applied to Negroes. Studies of other "racial" groups will be mentioned, but only when they raise problems pertinent to the interpretation of the data on Negroes. This article, therefore, should be regarded as an attempt to summarize some of the more important findings in this field and to discuss certain prob-

lems of methodology and interpretation which they raise. Extensive reviews of the experimental literature dealing mainly with intelligence testing have been made by Pintner (38), Canady (8), Witty and Lehman (55), and Thompson (46). For excellent summaries of the whole literature on (a) race differences, see Garth (19) and Klineberg (29); (b) psychological characteristics of the American Negro, see Klineberg (28) and Thompson (46).

The kinds of tests administered have been those to determine the relative keenness of the senses, motor ability, intelligence, musical talent, memory, mental fatigue, aesthetic capacity and disposition, handwriting, achievement, and other abilities. There have been comparative studies of eidetic imagery, emotionality, incidence of mental diseases, personality, "racial" disposition to crime, and other traits.

RESULTS AND DISCUSSION

As we proceed with this summarizing, it will be well to keep in mind as a guide in reaching our conclusions the formula given above ($R_{\text{a}}E_{\text{D}}O \cong R_{\text{e}}E_{\text{D}}O$) and the discussion on the difficulties of controlling the various elements which operate in comparative studies.

Differences in Simple Psychological Functions. Travelers at various times have attributed remarkable superiority to savages and primitive peoples in perceptual functions. These casual observations are important for us because of the popular belief that the development of the intellect in the white man "has occurred at the expense of the simpler forms of psychological activity." A great many attempts have been made, therefore, to find out how primitive and civilized individuals differ from one another in rather simple functions such as sensory acuity (e.g., seeing, hearing, touch, and pain senses), motor ability (speed of reaction and speed of tapping), and simple judgments (such as the form-board test). The studies prior to about 1900 were of little significance, principally because of the small number of subjects (2); but as more and more evidence accumulated after the turn of the century (34), especially Woodworth's (56) study which appeared in 1910 based on a variety of primitive groups tested at the St. Louis Fair in 1904, the popular notion was rejected by experimental results. The conclusion that when proper allowance is made

for training, the sensory and motor abilities of primitive peoples are much like those of more civilized peoples, although arrived at over a quarter of a century ago, still seems to be true.

The early studies of elementary psychological abilities are of interest and value principally because (a) they represent early attempts to discover by means of scientific techniques something of the nature and extent of "racial" differences; and, (b) they demonstrated that "racial" differences in physical traits need not be accompanied by psychological differences, at least of the more rudimentary sort such as those described.

It remains to be seen from the investigations of "racial" differences since 1910 whether significant differences exist in the higher and more complex psychological processes.

Differences in Intelligence-test Scores. In the psychological study of the Negro no other problem has attracted so much attention as the question of the inherent intellectual superiority of whites over Negroes. The amount of investigation engaged in since the advent of the intelligence test has increased rapidly, especially under the impetus of the testing undertaken during World War I, and the experimental literature is extensive. No attempt will be made in this section to give a detailed review of all the studies of Negro intelligence (standing in intelligence test) as excellent summaries are readily available (8, 38, 46, 55). Some effort, however, toward a brief critical examination of both the method and interpretation of quantitative investigations of the intelligence of the Negro in the light of *recent history of intelligence testing* (50) will be attempted here. But first let us give some actual results obtained by the use of tests in this field.

In most cases, the *average* intelligence-test scores of Negroes have been lower than those of whites. In certain localities, however, the Negroes' performance shows no inferiority to that of whites. The recognition of this aspect of the problem was first brought to light by the Army testers (World War I) who found Negro recruits from the North, not only far superior to Negroes from the South but in several instances actually superior to the whites from a number of the southern states (57). The Mexicans, American Indians, and Italians usually obtain the lowest scores, with the Negro definitely above. Several recent studies have

demonstrated that gifted Negro children (I.Q. 140 and above) are no anomalies. As an example of this, the work of Witty and Jenkins (53) is sufficiently convincing. Among 8,000 Negro children, they identified 26 of I.Q. 140 and above, one of whom is a child of surpassing test-intelligence (54).

The methodology employed in attacking the problem of Negro-white "racial" comparison has been simple. The procedure typically followed is to select two groups of subjects, one composed of Negroes and the other of whites. Usually some basis of control, often superficial, is instituted; that is, the two groups may either be within the same age range, or residents of the same locality, or both. A standardized test is then administered to each group, average scores calculated and comparisons made after consulting age equivalents or norms. Any difference found in *average* scores is attributed by one school of thought to the existence of innately determined psychological differences between Negroes and whites, and by another, to the influence of social and cultural background. Incidentally, there has been such a growing number of psychologists who have abandoned the former and once popular school of thought until today it has only a few representatives as, for example, Porteus (39).

It is significant that, almost without exception, all measurements of the Negro have been made with tests standardized chiefly on northern, urban whites. Such a procedure is unjustifiable, for tests are applicable only to individuals similar in their experiential background to the group upon whom they were standardized. When we administer these tests to individuals from widely differing social, economic, and educational levels, we violate not only the original aim of mental testers but also the basic assumption of the intelligence-test method.

Binet was fully aware that his test did not measure innate ability completely divorced from the influence of environment. He postulated modifiability and consistently held that intelligence shows change in relation to shifts in environmental influences (4). Furthermore, he insisted that tests must utilize materials that are appropriate to the environment of the subjects tested, and that tests were valid only for those having essentially the same environment. But when these conditions are satisfied, he considered test-ratings fair measures of com-

parative ability on the reasonable assumption that normal children will be exposed to much the same facts, and hence will acquire much the same information.

It is precisely at this point that the difficulty of making valid group comparisons lies. Even if tests were faultlessly constructed, they would be useful in making Negro-white comparisons when, and only when, the groups tested have had approximately the same schooling and the same common background of experience (55). Two studies on African children have signalized some important factors to consider before generalizing about innate Negro-white differences. In the first, Loades and Rich (32) translated tests from the Goddard revision of the Binet-Simon scale, 1911, into Zulu and gave them to 100 boys and 35 girls at the Adams Mission Station in Natal. They had to change many of the test items "solely because the Binet-Simon Tests are based on cultural conditions not present among natives, or on educational practices not here prevalent." A number of specific instances are given. In the second study referred to above, Nissen, Machover, and Kinder (36) administered a series of twelve performance tests to 50 native West African Negro children living within the area which supplied many Negroes for the American slave trade. Comparison of the tests on which the children did well with those on which they did poorly showed that the difficulty of the tests for the children increased as the content and activities involved were more closely related to the particularized experience of a civilized environment and, conversely, that those tests that are rooted in basic, less differentiated experience common to all "races" in all environments were handled with relative ease and yielded the highest scores in terms of norms obtained with the standardized groups. Thus the presence of cultural and other factors in intelligence tests was demonstrated.

The unsuitability of attempting to evaluate the intelligence produced by one culture in terms of another and the decided advantage to the group in which the test arose are obvious. But what is not so obvious, although none the less a fact, is that a subgroup within a nation that has had inadequate participation in cultural opportunities will be handicapped in much the same way as one belonging to a wholly alien culture. If, therefore, it can be demon-

strated that the experiential background of the American Negro child differs appreciably from that of the white upon whom the tests were standardized, the test results may not be used as a measure of the relative innate ability of the two groups.

Several investigations have revealed that most American Negro children are the products of a narrow and circumscribed world (14, 26); of poor home conditions (18); of poor recreational facilities (58); of an impoverished social and cultural environment outside the school (35); of extremely inadequate schooling (5), and of a poor economic environment (42), with all that this implies in regard to infant and child care, nutrition and health (45). Envisaged in these terms, Negro children approach the tests with a background of early training and environment which varies widely from that of white children and which will be reflected in their responses.

It would seem that the materials on the social conditions of American Negro children leave no choice but to assume that these children are so atypical as not to be fairly measured by existing intelligence tests; yet the precautions given by early mental testers have long been ignored, especially by "Racialists." One of the advances in contemporary testing, however, is the recognition of the obligation to construct and standardize tests that are valid for the culture of the individual. An effort in this direction has been made recently by Shimberg (41).

Differences in Non-Intellectual Traits and Special Abilities.—Recognizing that general intelligence is not the only inherited psychological quality on which success in modern life is dependent, attempts to measure special abilities and temperamental or emotional traits have been made. These have raised questions concerning the Negro's relative ability to exercise inhibitory power, to resist fatigue, to distinguish tones and rhythms, to solve mechanical problems, and the like (13, 30).

Results of comparative studies of *Personality Traits* of Negroes and whites indicate that, while differences appear on the surface, they can be explained as due to environmental factors and difficulties arising from the use of measuring instruments the reliability and validity of which are doubtful and not to "race." Even the study of *Color Preferences* offers no support to the stereotype of the Negro prefer-

ring bright and "barbaric" color combinations. Comparison of large groups of Negroes, whites, Indians, Chinese, Mexicans, Japanese, Filipinos, and other "races" indicates that, while culture may dictate various color preferences as blue for the American Negroes and whites, and red for the American Indians and Turks, the young children of all "races" show striking similarity of preference for colors. No evidence of the Negro's supposedly unusual ability in music has been found; nor have native differences come to light in any of the following characteristics: *speed, mental fatigue, handwriting, mechanical ability, or aesthetics.*

"Race" Mixture and Psychological Characteristics of Hybrids. "Race" mixture, or miscegenation, is a problem which has aroused much discussion in its own right (22, 51). Its advantages and disadvantages have been argued and studied at great length. There is one school of thought which holds that "racial" crossing is pernicious; another, that inbreeding is inadvisable, since new strains must be produced into a population if fertile, virile offspring are to be assured. The truth is that mixture in and of itself does nothing. Whether the genetic consequences are good or bad depends entirely upon what genes enter into the mixture. This means that, in the light of present knowledge concerning the inheritance of traits in man, the type of offspring to be expected from Negro-white or other crossed groups is dependent upon the endowments of the parent stocks on each side of the breeding process. "If the ancestors were capable members of their racial stocks, their crossed descendants will inherit the capabilities of their forebears. Conversely, a population may be ever so purely bred, and yet if the capabilities of the ancestors of that population were of a low order, the pure-bred stock will be poorly endowed for all its racial purity" (22, p. 402). Incidentally, the "racial" source of the Negro contribution to the process of hybridization in the New World has been investigated by Herskovits (23). He finds that the American Negro is not, as popularly supposed, a man without a past. His African ancestors were very capable people and brought here with them a cultural background that is to be regarded as highly sophisticated.

Psychological studies of Negro-white "mixed bloods" may be divided into those that deal with the relative intellectual capacity of mixed

and "pureblooded" Negroes and those that deal with personality pattern or structure. Results of the former indicate that Negroes with more "white blood" are not, by virtue of that fact, inherently mentally superior to Negroes with less "white blood"—which is a fundamental corollary of the racial-difference hypothesis (52); whereas the latter problem is virtually untouched by empirical investigation although it has not been neglected in sociological literature where it is usually treated in terms of Park's (37) concept of "the marginal man" and as a special but major case of that social type (49, 51).

Differences in Crime. Although crime is relative and an act regarded as criminal in one society may be unobjectionable in another, nevertheless, many people believe that "races" differ in innate criminal propensities. Thus the large percentage of crime in the United States has been attributed by some to the influx of certain classes of immigrants into our country. Similarly, many Americans firmly believe that the Negro is a born criminal because statistics can be quoted to "prove" that he is much more likely to commit crime than whites (3).

In the interpretation of crime statistics for Negroes, it is particularly difficult to disentangle the many uncontrolled factors which confuse the issue. Among such factors may be mentioned the Negro's low socio-economic status, with all that this implies in regard to slum conditions; the inequality in arrests and convictions among Negro-white groups; white criminals are more likely than Negroes to have political "pull" protecting them from arrest and conviction; some of the Negro's "crimes" are often merely violations of segregation laws, or failing to treat white people with proper respect or "disorderly conduct." When allowance is made for these and other social factors it seems unlikely that "race" as such plays any significant part.

Differences in Mental Disease. The question usually raised here is whether Negroes have any special susceptibility to mental disease (33, 40). Statistics on the problem, as in the case of crime, are incomplete, confusing and invalidated by a number of spurious selective factors among which are: lack of differentiation between "full-blooded" and the various degrees of mixtures of Negroes; inadequate hospital facilities for Negroes; poor conditions

under which Negroes live and over which they have no control, and difference in degree and manner of hospitalization—for example, wealthier families may care for patients in their own homes or private institutions. It can be said, however, that to date no fundamental qualitative differences with respect to mental disease have been discovered to exist between the American Negro and other "races." In other words, no type of mental disturbance has been found among American Negroes which is not to be found among other "racial" groups (40). This finding is important and suggests that mental disease is not a consequence of "race."

Difficulties in "Racial" Comparisons. In preceding sections we have pointed out here and there various factors that influence measurement and which must be controlled before any direct comparison between Negro and other "racial" groups (especially whites) can legitimately be made. These vitiating elements may be brought together and summarized as follows: (A) wide environmental and cultural differences, including such things as: (a) differences in social and economic opportunities, (b) differences in social heritage, (c) segregation and (d) inadequate educational facilities provided for Negroes; (B) the failure, and inability in many instances, of the experimenter to establish rapport with Negro children; (C) the speed factor which in many tests handicaps Negro children; (D) differences in motivation due to the position of the Negro in the American social order; (E) inaccuracy and ambiguity of the measuring instrument; (F) uncertainty of the purity of the "races" studied; (G) the difficulty of finding representative samples.

A considerable body of evidence is available which demonstrates the influence of the above factors upon measurement and group comparisons. Frequently such data were gathered incidentally in studies whose major purpose was the establishment of "race" difference in ability. A few investigations, on the other hand, have been conducted with the explicit aim of analyzing the difficulties in "racial" comparison. In either case, the data seem clear in their implication that factors other than "race" are operative in alleged "racial" differences. For this reason, some of the more recent studies in this field have included an attempt to equate the groups for one or more background factors

before making comparisons. There seems to be no basis, however, for this procedure (10).

Position of Anthropology and Specialists on "Racial" Psychology. In 1930 Thompson (47) circulated a questionnaire among "competent scholars in the field of racial difference" which revealed that only 4 per cent of the respondents believed in "racial" superiority or inferiority. He concludes:

"... The data reveal unmistakably that it is the general conclusion of scholars engaged in the field of racial differences and closely allied fields that experimentation to date has neither demonstrated that there are any *inherent* mental differences between American Negroes and American whites, nor corroborated the "mulatto hypothesis"—that Negroes with more white blood are *inherently* mentally different from Negroes with less white blood—which is a fundamental corollary of the racial-difference thesis." (P. 511.)

At the 1938 annual meeting of the American Anthropological Association (44), a resolution was unanimously adopted, in part, as follows:

"(1) Race involves the inheritance of similar physical variations by large groups of mankind, but its psychological and cultural connotations, if they exist, have not been ascertained by science . . .

"(3) Anthropology provides no scientific basis for discrimination against any people on the ground of racial inferiority, religious affiliation, or linguistic heritage." (P. 30)

Recently, a group of psychologists prepared a protest against the "non-scientific interpretations" of "racial" psychology which "Fascists are using to justify persecution." The protest was prepared by psychologists who are specialists on "racial" psychology and was issued officially by the council of the Society for the Psychological Study of Social Issues. It reads (48), in part, as follows:

"In the experiments which psychologists have made upon different peoples, no characteristic, inherent psychological differences, which fundamentally distinguish so-called 'races' have been disclosed. . . . There is no evidence of an inborn Jewish or German or Italian mentality. Furthermore, there is no indication that the

members of any group are rendered incapable by their biological heredity of completely acquiring the culture of the community in which they live. This is true not only of Jews in Germany, but also of groups that actually are physically different from one another." (Pp. 7-8)

The position of American anthropology and specialists on "racial" psychology is thus clearly stated. It is that scientists have not ascertained whether differences in psychological characteristics exist among the "races" of men. More specifically, the position would be that it is at present wholly unknown whether there are differences in psychological functions as related to biological variations in "race." Furthermore, it seems safe to say that recent history of the scientific study of the Negro represents an increasing trend toward the repudiation of all positive findings with respect to "racial" differences.

CONCLUDING STATEMENT

This very brief summary of the vast amount of experimental material on the psychology of the Negro makes clear at least some of the difficulties in the way of evaluating the comparative psychological endowment of the Negro and other "racial" groups by means of present methods of study. Until and unless the various factors affecting the results are adequately controlled, such comparisons will have little meaning; meanwhile, probably the best thing is to act as if all "races" had equivalent psychological qualities. Thus, when all attempts to find inherent differences in psychological characteristics between Negro and other "races" are taken into account, the verdict of *not proved* is the only one that can be given at this time. But we must keep our minds open, and be prepared sometime to have it proved that, in some characteristics at least, there are marked divergencies.

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P

PARAPSYCHOLOGY (a division of psychology dealing with the paranormal—those psychical effects which appear not to fall within the scope of what is at present normal and recognized law).

HISTORY

Among primitive peoples many experiences occur which suggest the reality of a mode of psychical functioning distinct from the ordinary contact of the senses, and of behavior, with the environment. Dreams or waking impressions may appear to forecast the future, or thoughts may appear to be caught from the mind of a distant person. Objects also seem at times to move as if acted upon by a purposeful but invisible agency. Either of these types of phenomena may suggest to those who experience them the action of discarnate intelligences. The Greco-Roman world, and ancient India and China, were very familiar with experiences of these same types. They engaged the attention, for example, of Aristotle and of Cicero; and though frequently condemned as the work of malign spirits, continued to interest the thoughtful until the rise of modern science in the seventeenth century tended to make the literate public hostile to reports of such experiences. Yet events of these types continued to be reported in large number, and by men worthy of attention, such as Ben Jonson, Goethe, and Linnaeus.

The nineteenth century could no longer tolerate the attitude of simple negation, and efforts towards a scientific investigation of this borderline area of knowledge began to take shape. Sir William Barrett (2) reported successful experiments in telepathy, and Sir William Crookes (12) described observations of materializations produced by a medium. In 1882 a group of scholars largely drawn from Cambridge University founded in London the *Society for Psychical Research*, an organization devoted to systematic inquiries into alleged paranormal phenomena of all the types mentioned above.

Prominent in the group were Henry Sidgwick, Frederic W. H. Myers, and Edmund Gurney. William James shortly thereafter participated in the organization of a similar society in the United States. This latter soon became a branch of the London Society, with research mainly in the hands of Richard Hodgson. After Hodgson's death in 1905, an independent American Society for Psychical Research was organized by J. H. Hyslop. The London and American societies publish Proceedings for general circulation and a Journal for the membership. An *Institut Metapsychique International* publishes in Paris the *Revue Metapsychique*. These three organizations, together with the Parapsychology Laboratory of Duke University, constitute the chief research centers today. Cambridge University has continued to play a part in such investigations; from Harvard University, Stanford University, and the University of Colorado has also come a considerable volume of research in this field. Psychical research organizations have been founded in some thirty countries, and, beginning in 1921, four international congresses of psychical research have been held.

SPONTANEOUS TELEPATHY

In 1882 it became the task of a committee of the (London) Society for Psychical Research to conduct a systematic study of the extent and nature of impressions appearing to involve contact between one mind and another through channels other than the senses; the results were published in Gurney, E., Myers, F. W. H., and Podmore, F., *Phantasms of the Living*, 2 vols., 1886. Partly by published notices, partly by consulting biographical and other records, but very largely by person-to-person inquiry conducted by a large group of volunteers, cases of apparent paranormal contact between persons were gathered. The first such person-to-person inquiry reached over 5,000 individuals and netted many experiences suggesting such apparent contact. A typical case of spontaneous telepathy (20, I, p. 188) is that of a woman who woke

suddenly with the impression of receiving a violent blow on the mouth. Two hours and a half later her husband came in from boating, his lip bleeding from a blow caused by the tiller of the boat. The time agreed well with the time of the wife's awakening. A case thus corresponding with fact was called *veridical*. Statistical evaluation of the hypothesis that these are due to sheer coincidence (impressions bearing no functional relation to the facts) is difficult in the case of events as infrequent and poorly recorded as are impressions of blows upon the mouth. With one class of experiences, however, statistics are feasible; namely, impressions of the death of a distant person when no knowledge of his illness or of danger to him is available. A woman awoke with a feeling of sadness; an hour or so later she had a vision of her brother tripping over a rope and falling, and exclaimed that he was drowned (35, I, p. 283). In point of fact, her brother, on a harbor boat, had in the early hours of the morning been caught by the tow-line, thrown from the deck, and drowned. The number of such veridical impressions of death was large.

The statistical question is defined by the death rate: the likelihood that a person X will die on a given day. The inquiry covering a twelve-year period treated dreaming and waking impressions separately. The investigators wished to know first how common it was to have a dream coinciding (within twelve hours) with the death of an acquaintance. To 5,360 persons the question was put, "Since January 1, 1874, have you ever had a dream of the death of some person known to you, which dream you marked as an exceptionally vivid one, and of which the distressing impression lasted for as long as an hour after you rose in the morning?" An affirmative answer was given by 173 of the respondents. After excluding some cases not meeting the requirements, it was concluded that about one respondent in each 26 should be included in the affirmative category. The probability that a person taken at random will vividly dream of death in this way in the course of 12 years is about one in 26. Now in terms of the death rate (22 per 1,000) the probability that any given person dreamt of will die within 12 hours of an assigned point of time was about $22/1,000 \times 1/365$; hence the probability that, in the course

of 12 years, a specific vivid dream of death and the death of the person dreamt of would fall within 12 hours of one another was $(1/26) (22/1,000) (1/365) = 1/431,363$. After further analysis, they concluded that each group of 431,363 persons in the United Kingdom would by chance produce one such coincidence in the given time. Now if the appeal for evidence had effectively reached as large a section of the population as this—431,363 who had such experiences to communicate—the number of such genuine death coincidences which ought, by the theory of probability, to be encountered, is 1. The number actually encountered in the whole investigation among all sources—of vivid dreams of death, by persons free from anxiety, and falling within the time limit—was 24. It was pointed out that there might well be a general tendency to remember veridical and to forget non-veridical cases. But the yield of so many veridical cases could be explained on a chance basis only if Englishmen have on the average many distressing dreams regarding the deaths of those with whom they are acquainted. Yet in fact the very data from which these computations are made show that most individuals replied to questions about such experiences by saying that they had never had such a dream, either veridical or non-veridical.

And many of the dreams were not simply dreams of death, but produced very specific correct details as to the cause of death. Statistical treatment of *hallucinatory* (waking) experiences of death followed similar lines, and led to a similar result. This early study was noteworthy for its extensive and subtle analysis of the telepathic process. Much use was made of the newer knowledge of dissociated and sub-conscious phenomena, to which Azam, Richet, and Janet had already given much attention. It was pointed out that the phenomena belonged to a psychological realm outside of the ordinary conscious sphere of activity. There was, however, a sharp difference of opinion between Gurney and Myers as to the *collective veridical hallucination*, e.g., in which two or more people, together at the time, experienced veridical hallucinations related to the same distant happening. Gurney argued that one percipient received the impression and transmitted it to the others; Myers, that the agent in some sense invaded the region where all the percipients were.

Another extensive survey of spontaneous telepathy was published in 1894 in the *Proceedings of the Society for Psychical Research*, under the title, *The Census of Hallucinations*. This contained many new veridical cases and a similar statistical analysis, indicating the implausibility of a chance interpretation. Since that time the London and the American societies have continued to publish current spontaneous cases each year. In 1931, W. F. Prince (45) published a survey of such cases (and cases of related types) based on a questionnaire addressed to 10,000 persons in *Who's Who in America*.

As to the psychological basis for such spontaneous telepathy, these many studies appear to indicate: (a) that the motivation, the *need for contact* on the part of the percipient, the agent, or both, plays a large role; (b) that sleep and semi-sleeping conditions are highly conducive to such impressions; (c) that waking states of dissociation such as the "brown study" or extreme absent-mindedness are favorable; and (d) that certain involuntary dissociated activities—"automatisms"—such as writing and hallucinations stimulated by a bright surface such as a crystal, allow impressions which have been received at a deep level—in Myers' language, received by the "subliminal" (35)—to work their way into the channels of expression. The most systematic study of the *modus operandi* of spontaneous telepathy, particularly as it relates to apparitions seen at or after the time of a distant person's death, is the work of G. N. M. Tyrrell (75).

EXPERIMENTAL TELEPATHY

But the gathering of spontaneous cases appears unsatisfactory from the point of view of establishing clearly the dynamics of the process or processes involved. As in other branches of psychological research, experimental methods are demanded if basic principles are to be clarified. For this reason the study of spontaneous cases has tended to be more and more subordinated to the experimental study of telepathy and related problems. Between 1882 and the end of the century numerous experiments in telepathy were conducted in Great Britain, the United States, and Germany; for the most part, impressions of drawings were to be transmitted. In the nomenclature developed, the *agent* or transmitter undertook to convey the impression to the *percipient* or receiver. Occasionally such studies assumed statistical form, and occasion-

ally they threw light upon the psychodynamics of agent or percipient; many such studies indicated, as we noted in relation to spontaneous experiences, that dissociated states are especially favorable. Early in the present century Miles and Ramsden (34) reported long and striking series of experiments, while Usher and Burt (77) gave especially striking evidence that dissociation was of special importance.

The last named investigators described an experiment that had been set for 8:30 P.M. During the day preceding the experiment, the percipient B told his friend C that an experiment was to take place and that she might take part if she wished. The agent A, who was at a distance of several hundred miles, did not, of course, know of C's participation. That evening A dined in a little Bohemian restaurant, and after dinner began a game of chess at the same table. At an adjoining table three men were talking loudly; they were eating roast capon with bread sauce. The room had green hangings. In the next room someone was strumming on the piano. At 8:25, A suddenly recalled that the experiment was due and hastily withdrew to a quiet place. Here at 8:30 he concentrated on a diagram. The impression received by C in automatic writing included the following items: "Roast capon, bread sauce, three men, much talk, green hangings, somebody strumming." With it was a crisscross pattern resembling a chess board. Now the important thing dynamically, in this as in many other cases, is that nothing was received at the conscious level; the whole communication came through automatic writing.

In 1921 and thereafter, René Warcollier (80) developed this conception experimentally and theoretically. He established in Paris a group for telepathic studies, which, in collaboration with "telepathic posts" scattered throughout Europe, studied the nature of telepathic images and of the relaxed and dissociated states in which they tended to appear, and a series of transatlantic experiments with a New York group was reported to the Third International Congress of Psychical Research in 1927. To the same period belongs the careful study by Dr. Carl Bruck (5), of Berlin, of the telepathic powers of four subjects under hypnosis, as compared with their powers in the normal state. Very complex drawings prepared and placed in a portfolio in another room were in many in-

stances reproduced with great accuracy. But the best subject did about as well in the normal state, and neither this nor the later studies by Rhine (49) and Grell (18) seem to settle conclusively the question of the utility of hypnosis for such research. Bruck's data do, however, strongly support the view (a) that the motivation to succeed was intense, (b) that very extreme concentration on the task was essential. In the same direction point the many tests of the powers of the Polish sensitive Stefan Ossowiecki, who through the 'twenties and 'thirties gave many demonstrations under good conditions. For example, a lightproof packet was prepared by T. Besterman (4) in London, in the form of a slip of paper enclosed within three envelopes. The paper contained a drawing of a bottle of Swan Ink. Lord Charles Hope, with this in his pocket, tested Ossowiecki in Warsaw. In his state of concentration Ossowiecki drew the bottle and the letters SWA IN. There are many such scattered tests; but only when the working conditions are well described do they throw light on the dynamics of the processes involved.

During the first World War, experimental studies of telepathy were reported by J. E. Coover (10), at Stanford University, and by L. T. Troland (74) at Harvard, both using methods permitting statistical treatment of results. While Coover's data showed success in guessing playing cards at a level four P.E. above chance expectation, he concluded against interpretation in terms of a paranormal result. Troland's very limited data are hard to interpret. An important forward step was taken by three psychologists (6) of the University of Groningen in the Netherlands who, in 1921, presented to the First International Congress a series of well-controlled studies involving the transmission of material which could be appraised from the statistical viewpoint. Two rooms in the laboratory were used, one directly above the other. A hole was cut in the floor of the upper room and two sheets of glass placed therein, with an air cushion between. It was thus possible to look from the upper into the lower room, but no voice could be heard in the lower room even when one shouted. The psychologists took turns as agent; a student of dentistry was the percipient. The materials to be transmitted consisted of letters and numbers arranged on a board as indicated in Fig. 1.

6	6	6	6	6	6	6	6
5	5	5	5	5	5	5	5
4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2
A	B	C	D	E	F	G	H

In each experiment they drew from a bag a slip of paper determining which letter, from A to H, and from another bag a slip determining which number, from 1 to 6, was to be used. The two slips together thus designated one specific square on the board. In the room below was a wooden framework covered with black cloth on its upper and three lateral surfaces. The chair of the blindfolded percipient was placed so that his back was to the open side. His right arm extended through an opening so that the hand and a part of the forearm were visible to the experimenters in the room above. Before the percipient's hand lay the board just described. The purpose of the experimenters was to impel the subject by their own volition to move his finger to the square which had been chosen by lot and upon which they were concentrating their attention. The percipient's signal that his choice had been made was a double tap with the forefinger upon the board; thus no premature termination of a given experiment could result in a spurious success. Six experiments at a time were carried out under these conditions; the experimenters then came into the percipient's room and performed six experiments at close range, changing the position of the board upon entering as well as upon leaving the room (throughout the experiment these two conditions alternated). Of 187 experiments conducted, one in 48 or approximately $4\frac{1}{2}$ in all should have been successes according to the theory of probability. Actually, the number of successes was 60. Curiously enough, 40 per cent of the experiments between two rooms were successes, but only 30 per cent of those in the same-room condition. The experimenters suggested that in the latter case the attempt to

be on their guard against unconscious whispering, and the like, had perhaps interfered with their concentration. Over and above the number of complete successes, the amount of deviation upon the board from the correct square was noted in the case of all errors, and it was found that the distribution of errors followed a normal probability curve; deviations of one square from the correct square were much commoner than deviations of two squares, etc. Alcohol was used in a few trials and seemed to have a markedly beneficial effect on the results; in fact, of the 29 trials in which the subject took 30 grams of alcohol ten minutes before the experiment began, 22 were successful. Upon this the investigators comment: "Alcohol overcomes the individual's normal inhibitions. The decrease in self-consciousness and the tendency to more superficial ideas are symptoms of this lack of inhibition." The subject's reports of "passivity" or "relaxation" also coincided well with his most successful efforts; a study of the galvanic skin reflex gave results which seemed confirmatory to this view (7). At the same time he was apparently in full "concentration" upon the task.

These studies were followed by the work of G. H. Estabrooks (15) at Harvard, likewise using separate rooms for agent and percipient, and obtaining statistically appraisable results. Playing cards were used as "targets" (material to be guessed) with 83 subjects, each guessing 20 cards from a complete deck shuffled and cut. The most striking feature of the results was the huge excess of correct guesses (of color and suit) over chance expectation in the case of most subjects' first ten guesses; during the second ten guesses a rapid decline of scoring successes regularly occurred (such "decline effects" have many times been repeated).

THE DUKE UNIVERSITY EXPERIMENTS AND THEIR SEQUELS

The investigation of experimental telepathy was revolutionized and redefined by the studies conducted at Duke University from 1930 forwards by J. B. Rhine, the first report appearing in a volume entitled *Extra-Sensory Perception*, 1934. Using sets of 25 cards, each card bearing one of the five symbols, ☆ □ ≈ + O, he and his associates tested the effect of many physical and psychological variables upon a very large number of subjects, adult and child, normal and abnormal. It became a consistent part

of experimental procedure to include in the larger studies some preliminary investigation with no attempt at perfection of experimental control, followed by large masses of results using rigid controls (these will be described briefly in connection with each experiment noted below, but the original papers should be consulted).

But the word telepathy does not suffice to classify Rhine's work. Though telepathy has been studied, many of the Duke University experiments were carried out under conditions chosen to preclude knowledge of the stimulus materials on the part of the experimenter as well as the subject. Decks of cards were, for example, shuffled by the agent but not looked at during the test, or in other cases shuffled by a third party and handed face down to the agent. In many cases cards were placed behind screens or concealed individually in opaque envelopes, the order of the symbols upon them being known to no one.

One of the recurrent problems was the effect of distance. Accordingly, the subject Hubert Pearce went to a room in the Duke University Library while the experimenter, J. G. Pratt, established himself with the cards in the Physics Building one hundred yards away, in a room facing away from the library. Their watches were synchronized. The experimenter would take the top card from a shuffled pack of ESP cards in the room agreed on and lay it face down on a book in the center of the table without looking at its face. Thirty seconds later the subject in his cubicle in the Duke Library would record a call for the card. At the end of the minute, the observer would remove the card and take the next one. The cards as removed would be kept in order for later recording. Two runs, of 25 calls each, were made per day. Pearce's record and Pratt's record were both made in duplicate and were independently submitted to Rhine, scored and photostated. The hits in this first series by runs of 25 were as follows: 3, 8, 5, 9, 10, 12, 11, 12, 11, 13, 12. Since the expected number (by chance) is 5, a score of 11 or better should occur about four times in 700 runs. A second such series was performed under the same conditions but with the experimenter and cards 250 yards away in the Duke Medical Building, and the scoring level was again such that an experimenter should not expect to see it arising by chance once in a lifetime. In all, four such long-distance series

with Pearce were done, as shown in Table I; each may be compared with the "same room" condition (Group E). Distance appears unimportant (52).

TABLE I

Group	Conditions	Number of Trials	Average
A	Physics building and library	300	9.9
B	Medical building and library	1100	6.7
C	Physics building and library	300	7.2
D	Physics building and library	150	9.3
E	Same room	900	8.2

The large number of experiments yielding significant results by these methods was offered as warranting the conclusion that direct clairvoyance is possible, the subject making contact somehow with the stimulus materials, not with the mind of any person. Rhine concluded that in many earlier experiments purporting to test telepathy the results could have been achieved *either* by telepathy from the mind of the agent or by clairvoyance, or by a combination of the two. The classical type of experiment in which the agent looks at the target material might be regarded as ambiguous; Rhine classed such experiments under the term "general extra-sensory perception."

Rhine experimented on the influence of drugs (51) upon scoring level (sodium amytal reducing the scoring level of good subjects, and caffeine tending to restore it), and made extensive comparison between different methods of "calling" (making guesses), such as: DT (down through), in which the subject guesses each card in a face-down deck from top to bottom; open matching (OM), in which face-down cards are matched, one at a time, against the five key cards; and BM (blind matching), in which the cards are matched against key cards whose faces are likewise not observed (in all but informal preliminary studies, the key cards are concealed behind a screen or placed in opaque envelopes). He was able to show that determination to obtain a below-chance score could be as successful as an effort at high scores.

The publication of *Extra-Sensory Perception* and of many articles in a journal founded in 1937, entitled the *Journal of Parapsychology*, marked the organization of a vigorous movement for studies of experimental problems in

psychical research, the term parapsychology tending to be identified with the experimental aspects of the field, though frequently (as in the case of the present article) it has seemed best to include spontaneous and experimental data in their interrelations. The *Journal* has carried reports from some twenty departments of psychology. While these many studies cannot be reported here, the University of Colorado study by Martin and Stribic (33) requires mention, for in screened DT studies over three years, some 250,000 calls, from several hundred subjects, were obtained, with a CR of 45.70 (as compared with a CR of 1.00 from control data) and with an intensive study of the performance of one high-scoring subject for the whole three-year period.

Criticisms of the work (e.g., 30, 31, 44, pp. 183-241) have been numerous, notably in terms of (a) selection of data from certain subjects, withholding data from others; (b) faulty statistics; (c) errors in recording; (d) loose method in exclusion of sensory cues. A full appraisal of these matters is not feasible here, but it may be indicated (a) that the original 1934 volume *Extra-Sensory Perception* published all data secured by the methods reported and that the same practice seems to have been very consistently followed by the *Journal*; (b) that the statistical issues, dealing chiefly with the question whether the standard deviation for the deck of 25 cards should be 2.00 or 2.04, or between the two, have never been shown to be pertinent to the experiments offered as clear evidence, in many of which critical ratios of 5.00 and higher have been achieved; (c) that recording errors appear chiefly to take the form of occasional omission of a hit; and (d) that hundreds of thousands of calls have been made at long distance or with screened or concealed cards.

Since 1938, when a round-table on ESP methodology was held at the meetings of the American Psychological Association (16), emphasis has been placed upon studies simultaneously meeting such objections; for example, by using two experimenters, numbered record sheets, and two independent checkings of data. In an especially well-planned study, for example, by Pratt and Woodruff (43), showing the influence of novelty of target material (in that scoring level rises with the introduction of each new task in a series of tasks), very rigid condi-

tions were in force. Two experimenters participated. The subjects used a matching method, the key cards being placed on the subject's side of a screen, while the experimenter, on the other side, placed each card in a face-down deck opposite one of the key cards as directed by the subject; the subject made his call by indicating with a pointer thrust beneath the screen (screened touch matching, STM). The experimenters' faces were not visible to the subjects. Serially numbered, identifiable record sheets were used and triple score records made. No omission or selection of data could have occurred. The data from 32 subjects gave a critical ratio of 4.99. The issue has therefore melted down largely to the question of belief in the competence of the experimenters. Since many groups of investigators, aside from those at Duke, are concerned, the issue appears to be a question of the amount of evidence required to overpower the huge *a priori* incredibility of the phenomena. (For an over-all survey of ESP research up to 1940, v. Pratt, J. G., Rhine, J. B., Smith, B. M., Stuart, C. E., and Greenwood, J. A. *Extra-Sensory Perception after 60 Years*, 1940.)

PSYCHOLOGICAL FACTORS IN SCORING-SUCCESS

In an attempt to discover favorable psychological conditions, numerous studies (e.g., 42) have dealt with the influence of the personality and manner of the experimenter when different experimenters employ the same external control of conditions, yielding evidence that one experimenter can obtain consistent significant results while another cannot. Typical of the many studies dealing with motivation is one by Price (44, p. 283) with 25 children, the method being screened open matching. When children worked alone, the average score was 5.2; in a competitive situation 6.5. There has been a huge amount of study (44) from several laboratories, of "decline curves" (of the sort described by Estabrooks, *vide supra*), pointing apparently to loss of interest on the part of the subject; and there has been much evidence of the Gestalt principle of perceptual organization, in that relatively more of the first and last calls in a series of 25 than of the intervening calls are correct (51). Likewise, when the record sheet is marked off for groups of five calls, the first and last calls in each segment of five are influenced by ESP more than are the intervening calls (decks be-

ing inaccessible to the senses); these effects are designated *run salience* and *segment salience* (53).

It must be stressed that no completely satisfactory "repeatable" experiment has yet been devised, such that any experimenter could, by following specifications, assure himself of a positive result. Much effort has been devoted to the problem, of which G. R. Schmeidler's work will serve as an example. The primary hypothesis formulated by Schmeidler (58, 59, 60, 61) was that when tested by equally rigid procedures, those believing in the possibility of paranormal phenomena should be expected to give themselves to the task with greater freedom than those who reject the theoretical possibility of the paranormal, so that in time significant differences in scoring level between these two groups should be achieved.

The method was to place decks of 25 cards—or simply lists of such symbols—in concealment (in a room or closet away from the subject) and to require the subject to guess the symbols in order. Lists of random numbers were used by an assistant in preparing these decks, so that the experimenter herself could not at the time know their order.

When it began to be evident that the data were consistently conforming to the expectation, an additional series of subjects was deemed necessary; and not being content with a single repetition, the experimenter has since that time made use of one new series of subjects after another. Six extensive series of tests, no one of which comprised less than 200 runs of 25 cards each, were performed. Each such series gave results in conformity with the hypothesis. The tables below give the number of subjects, number of runs, critical ratio and p-value for comparison of the groups differentiated by attitude. It is the *consistency* of the difference between the two groups, always in the same direction, that should be stressed.

The six series therefore constitute a repeatable experiment in the ordinary use of the term. The effects, in absolute terms, are slight; indeed, the paranormal would probably never have become a controversial problem if the effects with ordinary normal people were large. But they seem to be as consistent as human material can be expected to be. Exactly what conditions must be fulfilled it is as yet impossible to say; there are many unspecified factors to be discovered. With

TABLE 1

Scores obtained in a card-guessing experiment by subjects who, in this experiment, accepted the possibility of paranormal experience and by subjects who rejected the possibility of paranormal success in scoring.

A. Subjects who accepted the possibility of paranormal experience.

	Series 1	Series 2	Series 3	Series 4	Series 5	Series 6
Number of Subjects	13	13	22	9	23	19
Number of Runs	129	127	133	162	207	171
Deviation from "chance expectation"	+56	+33	+31	+34	+45	+27
Mean Score	5.43	5.26	5.23	5.21	5.22	5.16

B. Subjects who rejected the possibility of paranormal experience.

	Series 1	Series 2	Series 3	Series 4	Series 5	Series 6
Number of Subjects	4	4	4	3	3	16
Number of Runs	200	175	199	54	27	144
Deviation from "chance expectation"	-10	-12	-12	-41	-23	-25
Mean Score	4.95	4.93	4.94	4.24	4.15	4.83

TABLE 2

Comparison of scores obtained in card-guessing by subjects who, in this experiment, accepted the possibility of paranormal experience and by subjects who rejected the possibility of paranormal success in scoring.

	Subjects who accepted the possibility of paranormal experience	Subjects who rejected any possibility of paranormal scoring success
Number of Subjects	99	34
Number of Runs	929	799
Deviation from "chance expectation"	+226	-123
Mean score	5.24	4.85
Critical ratio	3.71	2.18
P .....	.0001	.01
Difference between groups		349
C. R. diff.		4.12
P diff. ....		.00002

their discovery, increasing control should be possible. But that one important factor is attitude seems clear. These studies are illustrative of the contemporary emphasis upon attitude, and behind attitude, *personality*, as a fundamental factor in paranormal functions. Considerable work on the personality factor is in progress, notably through the Rorschach test, the Thematic Apperception test, and the Rosenzweig Picture-Frustration test.

WHATELY CARINGTON'S FREE-DRAWING METHOD

Most modern work in ESP has made use of prepared target materials permitting a simple statistical treatment: playing cards, Duke University ESP cards, or the like. It has, however, been very generally felt that completely free material—for example, drawings freely executed by the agent—might have many advantages;

certainly in their use boredom and various types of blockage could more easily be obviated. The use of these methods, however, alters the statistical problem. It is, for example, necessary to know how commonly a large group of normal people will think of and draw each of the various objects used in an experiment. Among the efforts to cope with this problem of evaluating free drawings are J. G. Pratt's (41) analysis of the material gathered by C. H. Rice, and C. E. Stuart's (67) preferential matching method. Whately Carington (8) has for a number of years devoted himself to the development of a suitable technique for long-distance tests of telepathy in which the agent, taking material from a large collection of words indicating drawable objects, executes ten drawings, while by prearrangement a large number of scattered and distant percipients draws at corresponding

times the impressions received. Having derived empirically from a huge mass of material a catalog indicating how often each item appears in such free drawings, he has made it possible to apply to the hits on each target-item a formula developed by R. A. Fisher:

$$(h-np)\log\frac{1}{p}$$

where h represents hits, n the number of calls made, p the probability (based on the catalog) that the call will be correct by chance alone; the variance is

$$(npq)\log\frac{1}{p}$$

where $q = 1-p$. It is now possible to assess approximately the total result obtained. The target material must, of course, be selected by some random method, so that under conditions excluding telepathy the likelihood of drawing a specific object such as a broom or an armadillo, at the moment when it is actually used, is no greater than at another moment when it is not used. With large masses of material, the data show that the method is practicable; control drawings do not correspond with the originals more than they should on a chance basis. Actually, however, in a long series of such tests with many different groups of subjects, Carington and a group of collaborating psychologists have been able to obtain repeatedly very striking results, indicating that the responses given by the percipients on a given evening do in fact significantly agree with the material prepared and used on that particular evening. The British results have been so consistently successful as to warrant the hope that this might constitute a genuinely "repeatable technique." But in view of the ambiguous results obtained by an American group who used this procedure (71), the question of repeatability is not yet settled.

PRECOGNITION

Among recent studies engaging the attention of the Duke University group and of several other investigators in the United States and Great Britain has been the problem of precognition, or direct perception of future events (not simply inference regarding their probability). One method has been to evaluate predictions of the order of cards which are to be shuffled later. Having obtained positive results by this method (57), the Duke University group

determined to eliminate any possible effect of the percipient upon the behavior of the experimenter who shuffled the cards. In consequence, the determination of the target order was made by a motor-driven machine (50) in which dice, determining the target order, came to rest in a manner not normally predictable; the targets were set up at various intervals after the original calls had been made. Under such conditions, also, significant results have been obtained. But the deviations from chance expectation in individual runs tend to be slight, the very significant results being achieved through accumulating large masses of data under uniform conditions. The effect of salience has been striking in such precognitive calling (50).

Precognition has also been extensively studied by Soal (64), and by Soal and Goldney (65) in England, in the form of precognitive telepathy (contact with another person's mental operations as of a later time). In the former study it had been found that a subject consistently made hits not on the specified target item, but on the item which followed, and precognition seemed to fit the situation better than did other hypotheses. In the latter study the subject under observation by one experimenter in one room made his calls; in another room another experimenter, under observation by still another person, drew counters of various colors from a bag in order to determine the target card. There was a marked and consistent tendency to hit not the target exposed at the time, but the one which came next. In another series, random numbers unknown to the experimenter determined the order of stimulus presentation; again there was displacement to the next target. The scoring level was of a very high order of significance in both series. The acceleration of the tempo of calling resulted in the subject's calling not the item immediately following the target item of the moment, but the item which came *two* steps later, suggesting that the constant in this individual case was the time duration between the moment of call and the moment of exposure of the target item. This finding is reminiscent of a study of C. E. Stuart (68) indicating that for success in ESP scoring there is, for each individual subject, an optimal tempo of calling.

PSYCHOMETRY

The term "psychometry" was coined some seventy-five years ago to describe the ability of

certain sensitives to give detailed information about persons when holding some object which had once been worn or owned by them. Thus Osty (36, pp. 104-109) handed to Mme. Morel the scarf worn by an old man who was lost; she gave a detailed description of the path he had taken through the forest, and his body was found. Similarly, in the studies of Pagenstecher (37) and W. F. Prince (46), Señora de Z., holding various objects, gave very detailed reconstructions of past events related to these objects of which neither she nor the experimenter could have had any knowledge; the reconstructions were subsequently verified. In 1940, Hettinger (21) carried out extensive experiments of this type with two sensitives in London, treating the data statistically in such fashion as to show that the statements made about the owner of each object were significantly more relevant to the owner than to control persons. It is currently held by numerous investigators that such results are simply a special case of telepathy.

PSYCHOLOGICAL PRINCIPLES IN ESP

As to the psychological laws apparently revealed by all the work on ESP (telepathy, clairvoyance, and precognition) up to the present time, the following would appear to be on rather safe ground: (1) Telepathy, clairvoyance, and precognition are closely related; they are similarly affected by various conditions, and stem from a common psychological matrix. (2) The optimal condition for their appearance is one involving both concentration and relaxation, in the sense that the task draws upon a level of activity in which the individual is completely absorbed in single-minded attention to the task. It might be more accurate to say, with C. E. Stuart (69), that "concentration" and "relaxation" are the 'dramatics' of ESP rather than optimal conditions for ESP. The matter of individual attention is important, but the particular device for accomplishing this is probably a matter of the individual personality." (3) The value of dissociated states, which appears in some studies to be great, probably lies in their predisposal to a state which thus permits complete devotion to the task. (4) Favorable motivation—whether conscious determination to score well or unconscious disposition toward the task as revealed clinically—is a variable of major importance. (5) Attitude toward the experimenter appears to influence such motivation

profoundly. (6) Attitude toward the task itself is also a major variable. (7) Individual endowment varies greatly.

INTERPRETATIONS

As to the systematic views which have developed regarding the nature of the phenomena, it is necessary to distinguish between those which attempt a straightforward psychological account of what happens and those which attempt to grapple with philosophical questions. As to the former, three current conceptions are worth noting: (1) Rhine (51) has emphasized the extra-physical properties of ESP as shown by its independence of distance and time (as far as it has been tested). He and his associates have stressed the configurational aspects of ESP performance, as in the case of decline curves and salience ratios, and have thus tended to put Gestalt psychology to work in clarifying the dynamics involved. (2) Associationist interpretations have been invoked, notably in W. Carington's (9) recent thesis. He stresses the apparent fact that all the mental phenomena of parapsychology behave *as if* the basic laws of association operated in exactly the same way whether a given mental content is all in one mind, or part of it in one, part of it in another. Carington notes that if the agent looks at or thinks of a word X to be "transmitted," at the same time associating this with some other object, called a *K-object*, and if the percipient at the same time perceives or thinks of a similar *K-object*, the K-X association will be facilitated in the mental matrix shared by agent and percipient, and X will consequently emerge in the percipient's mind. In the traditional type of experiment, the agent and percipient are both thinking of the experiment (and doubtless of various other things in common); this idea of the experiment serves as K. The hypothesis is absurdly simple, and is alien to our ingrained assumptions. Yet five large groups of experiments strangely conform to it, in the sense that the closer the associative linkage between the target items and the idea of the experiment, the better the results. In one group of experiments the target items were prepared and listed in advance (thus slightly linked with the experiment but not actually used); in another group they were both *listed* and *drawn* in advance (thus the associative link was stronger); in a third group they were *listed, drawn* and *used*

(here the linkage was close). The results in terms of mean scores per percipient per original were as follows:

Class	$10^3 \times \text{Mean D}/\sigma$	P
A. Listed, drawn and used..	21.212	4.67 10^{-5}
B. Listed and drawn, not used	4.332	2.00 .05
C. Listed, not drawn, not used	2.227	1.69 .09
D. Controls .....	.206	.16 .87

(3) While Carington's hypothesis is derived from classical association psychology, another, developed by M. P. Reeves (47), takes its departure from field theory of the Lewinian type, utilizing the concepts of tension and of region within the organism. She notes that the motivation or tension impelling to paranormal contact with a given target may lie either in the deeper strata of personality or at the surface. In general, the spontaneous cases express the former situation, the experimental cases the latter. Since tension in one region may inhibit the creation of tension in another, the need to perceive in one way may inhibit the need to perceive in another way; when normal perception is active, paranormal perception is inhibited. But when, through sleep, drugs, etc., the normal effort to perceive is removed, the tensions related to the paranormal may find an outlet. This formulation fits well with the facts available regarding the role of motivation and of dissociation in spontaneous and in experimental telepathy. It can probably be integrated with the Carington thesis if both should appear to be well substantiated by further evidence.

As to philosophical interpretations, almost every form of mind-body theory has been championed, but no one of them can lay claim to any special cogency. Three may be briefly noted: (1) Physical interpretations, as in the various modern elaborations of Sir William Crooke's (11) theory of "brain waves," conveyed from object to percipient, can be stretched so as to make some slight contact with telepathic findings, but the data do not fit the inverse-square law, and a physical interpretation of precognition involves an elaborate *ad hoc* form of speculation. Perhaps the physics of a future period will integrate with the data in a more evident way than does contemporary physics. The physiological aspects of extra-sensory capacities may

have some relevance to this physical question, but they have been studied only slightly. The physiological approach is considerably clarified by the discovery of the stimulating effects of certain drugs and the inhibiting effects of others; e.g., the Groningen study mentioned above showed the great facilitating effect of small doses of alcohol, while Rhine showed the depressant effect of sodium amytal on scoring level and the restorative effect of caffeine.

(2) Dualistic interpretations, positing a mental realm sharply separated from the physical realm, encounter all the usual difficulties, especially in connection with the *modus operandi* of mind-body interactions. And it is to be doubted whether they *explain* the phenomena. But what they do is to make the phenomena less "shocking," bringing them into line with less bizarre experiences in the realm of normal perception.

(3) There is nothing in the data to rule out a completely monistic system, perhaps of the pansychist type, in which all reality may be regarded as ultimately psychic, and matter a name for specific kinds of experiences referred to the observer's world of space (this is not Berkeleyan idealism; it regards nature as independent of man, being similar to Eddington's "philosophy of physical science" (14).

At this writing, one critical experimental task would appear likely to be very helpful in pointing toward a monistic or dualistic view. It will be recalled that Rhine has stressed the reality of clairvoyance—paranormal perceptual contact with objects as independent from telepathy—a view to which some other scattered evidence points. Clairvoyance appears to call for powers of an order very different from those involved in mind-to-mind contact (whether simply telepathic or in the form of precognitive telepathy). If clairvoyance could be eliminated, it would probably help to prepare the way for a monistic view, involving some sort of pansychist or double-aspect view. It has several times been suggested that clairvoyance is not in fact well established, since in experiments purporting to test clairvoyance, the subject may make precognitive contact with the experimenter's mind as it will be at the time of the check-up. This argument is not, however, appropriate in relation to the many studies by the matching methods, for example, to the Pratt-Woodruff matching experiment mentioned above, in which the order

of cards in the check-up was determined by the subject's order of placing them. Apparatus has recently been devised which will record total hits while never allowing any human mind to know the individual targets; this may perhaps help in studying the question of pure clairvoyance.

There is also considerable evidence for clairvoyance from dowsing—use of the divining rod to discover subterranean water (or minerals, etc.). The dowser holds a forked stick which turns down as he wanders over the ground when water is directly underneath. In a carefully planned experiment, Sir William Barrett (3) tested the well-known dowser William Stone, at Carigoona, Ireland, in a terrain unknown to him and offering no geological clues. The latter promptly found water at several spots. The testimony of geologists regarding the difficulty of the feat is a part of the record. Similarly Sir Henry Harben, who had invested large sums in boring for water under the advice of engineers without success, employed a well-known dowser, John Mullins, who quickly located springs 12 and 19 feet below the surface. There are many records of such feats, but the problem has not been systematically studied. It cannot yet be said categorically that the turning of the rod is solely due to a motor automatism on the part of the dowser, analogous to automatic writing; but there is much to support this view.

PSYCHOKINESIS

Along with paranormal cognitive processes, there have been reports throughout history of paranormal physical effects: lights, raps, movements not appearing to conform to ordinary physical law. The nineteenth century had its numerous cases of Poltergeists ("troublesome spirits")—loud sounds, violent movements of objects, etc., usually in the presence of a pre-adolescent child; and of lights, raps, materializations and levitations in the presence of a spiritualist medium. The reports of D. D. Home's floating through an open window in bright daylight (13), and the movements of a curtain, and kindred unexplained phenomena, in the presence of Eusapia Palladino (17), are typical fragments from a bewildering picture. Much fraud has been detected under loose conditions which permit it; but a very large mass of material remains unexplained. Systematic

and careful experimentation upon such phenomena under acceptable conditions did not, however, begin until the 1930's, when J. B. Rhine and his associates at Duke University embarked upon a program of research on the possibility of mentally influencing the course of physical movements outside of the body—psychokinesis or PK. Because of their mobility and the ease of obtaining with them a statistically meaningful result, dice were used, the subject undertaking to influence their manner of falling after being thrown. As in the case of ESP, rough preliminary studies were followed by more elaborately controlled experiments. In these experiments the dice have been found, under control conditions, to fall in a manner conforming roughly to the expected "chance" distribution; yet when subjects are instructed to endeavor to influence them, such an influence appears in significant form (25, 54, 55, 56). Typically, the instructions in one series are to try for *ones*, in another series for *twos*, etc.; the dice show different "preferences" as different psychological conditions obtain. While the dice are sometime thrown from a cup, various types of mechanical release of the dice have also been used. The following (56) are results with such mechanically thrown dice (a run is twelve throws of two dice each), the effort of the subject being to make the sum of the die-faces 8 or more, and chance expectation being 5.00 per run.

Runs	Average per run	Hits	Dev.	S.D.	CR
108	5.65	610	+70	17.77	3.94

Giving special attention to the problem of mechanical release, Rhine had a rotating cage constructed in which the dice were tumbled about; in the main series with this method (48), the subjects trying for specific die-faces, with chance expectation at 4.00 per run, the results were:

Runs	Average per run	Hits	Dev.	S.D.	CR
44	4.86	214	+38	12.10	3.14

One very striking aspect of the psychokinetic work is that the scores bear a clear relation to the structure of the task, as do ESP scores. In the case of PK, decline curves during each task are clear; but arrival at a new phase of the task, as in starting a *new record sheet*, is accompanied by a renewal of relatively high

scoring (54). These decline effects have been studied in a vast amount of material (over a million die-throws) and are so consistent as to achieve a very high level of significance. Their effect in a typical series (54) is graphically shown in Figure 2, in which the scoring level in each of the four quarters of the *record sheet*, 1, 2, 3, 4, is shown by the heights of the columns.

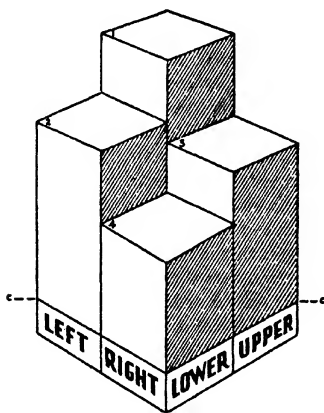


FIGURE 2

The effect is as clear when the subject aims to influence a large number of dice at once as when a single die is involved, and it is apparently not appreciably linked to the size of the dice—considerations which argue against the operation of any simple physical force of the types now understood. While ESP studies have been repeated in other laboratories, well-controlled work on PK appears to have been done in only a few laboratories.

MEDIUMSHIP

Throughout history, many of those experiencing paranormal impressions (especially apparitions and precognitive dreams) have attributed them to the action of the deceased. Without any prejudgment as to the facts, and with very profound sensitization to the biological difficulties involved in any hypothesis of survival beyond death, it has been one of the tasks of psychical research to pursue and investigate everything that might appear to bear upon this question. Apparitions coinciding with death, as reported above under the heading of spon-

taneous telepathy, are explicable on the assumption that the telepathic activity occurs at or just before death; but it must be noted that a very considerable number of cases qualitatively similar to the death-coincidence cases do occur days or weeks after the moment of death, and that some of them take the form of repeated appearances to the same person or to groups of persons, especially in the physical surroundings in which the deceased once lived. There has been much serious analysis of such cases, to see whether they support the survival hypothesis.

A more direct approach exists, however, to the survival problem. Throughout the Greco-Roman and medieval periods there had been certain individuals through whom came impressions purporting to emanate from the deceased; and with the rise of modern spiritualism in the middle of the nineteenth century, mediumship in this sense became widespread. Sometimes the medium, or mediator between deceased and living, experienced visions or voices in the waking state; sometimes messages purporting to come from the deceased took the form of automatic writing or of full-fledged trance, with loss of consciousness, and with control of the organism by a personality purporting to be a deceased individual. Many thousands of pages of such automatic writing or of trance utterance have been published with detailed analysis of the contents as bearing on the hypothesis that it derives from identifiable deceased persons.

Thus Mrs. A. W. Verrall (78) reported such incidents through Mrs. Thompson when a sitting was held in her (Mrs. Verrall's) home by a Mr. and Mrs. A. It was stated that Mr. A. had a relative, a "rare old lady for knitting"; that this lady used to carry about with her a round knitting-basket which contained her "top-knot, an ornament for her head, a cap you might call it, but it was a top-knot." Mrs. A. was well acquainted with an old relative of Mr. A.'s, who was a great knitter, but had never seen her with a round knitting basket or any cap basket, and knew nothing of a "top-knot." Mr. A. could throw no light on the statement. Mr. A.'s sisters, on hearing the above account, said that the relative in question, having somewhat thin hair in middle life, before adopting the old lady's cap, with which Mrs. A. was familiar, had worn a little knot of black lace on the top of her head which her young relatives called her top-

knot, and which she used to take about with her in a round knitting-basket.

It was also stated that Mr. A.'s mother, being "a clearing-up, methodical lady," possessed a manuscript receipt book, still in existence in her husband's house, and that in this book were receipts other than cookery receipts, and in particular a receipt for pomade, or, as the lady herself used to call it, "pomatum." It was known to Mrs. A. that her mother-in-law had had such a receipt book as described, but nothing of its contents was known to her. The existence of the book was not known to Mr. A. The daughters knew of the book, and said that *pomatum* was certainly the word used by their mother for the article in question. But they knew nothing of any receipt for pomade. The book was found; it had been written in from both ends and was carefully indexed. No receipt for pomade appeared in the index, but a search was made through the book. It was then found that the last five receipts, counting from one end, had not been indexed, and that among these was a receipt for pomade. The book had never, so far as is known, left the house where its owner had lived, and Mrs. Thompson had certainly never entered that house.

The term "evidential" is used with reference to such communications if there is cogent evidence that no normal knowledge of the information could have reached the medium. Attention has especially centered upon instances in which specific personal information known to have been possessed by the deceased is given through the medium to a sitter as evidence of identity, under conditions which preclude the possibility that either of them could have had access to the information. If telepathy be accepted as a fact, we face, of course, a grave complication, in that most items which might serve as evidence of identity will be known either to the sitter or to other living persons; and before survival after death can be regarded as clearly indicated, it must be shown that such information did not emanate from the minds of the living. The problems will be illustrated by reference to the work of two well-known trance mediums.

A young American woman, Mrs. L. E. Piper, had gone to visit a medium and in consequence had fallen into a trance herself, and began to give trance sittings. She became known to William James in 1885, who was impressed by

communications through her to his wife and himself, and her phenomena began to be studied intensively by Dr. Richard Hodgson and by the Society for Psychical Research in London. For some 30 years her trance communications were systematically analyzed, with emphasis upon two classes of material: (1) material known by the sitter but inaccessible to the medium; (2) material unknown to both medium and sitter, but verifiable by subsequent inquiry (cf. 79). An example of the former may be noted in personal details given by "G. P.," a friend of Hodgson, regarding items which he and G. P. had discussed privately (23). As an example of the latter, we may refer to the many communications purporting to come from F. W. H. Myers, a Greek and Latin scholar, who had died in 1901. Mrs. Piper had no classical education at all. Specific questions regarding Greco-Roman mythology and poetry which were addressed on many occasions to the purporting Myers communicator yielded striking results. Thus George B. Dorr held a sitting with Mrs. Piper in Boston in 1908, at the end of which he asked the purporting Myers, "What does the word Lethe suggest to you?" (39). The answer, during this and the subsequent sittings, was a complex pattern of Greco-Roman material. "Cave . . . sad—lovely—mate . . . Entwined love . . . a lady . . . a hoop and two pointed things . . . she pulled a string and she pointed it straight at me . . . Second sitting: Iris—Morpheus—CYX . . ." None of which was recognized by the sitter or by the classical group studying the Piper communications; the answer was regarded as a failure. But ultimately the mass of material was found near the end of Ovid's *Metamorphoses*, in connection with a journey to Lethe. It is the story of Ceyx and Alcyone. No generally accessible English source, such as Bulfinch's *Age of Fable*, contained the material; and whatever intelligence was communicating appeared to be working from the Latin text, not an English version. The Lethe question and answer were communicated to no one outside the S.P.R. group of classicists. Subsequently an envelope was sent by Sir Oliver Lodge to another sensitive, Mrs. Willett, in England; when this was opened she noted the question, "What does the word Lethe suggest to you?" The reply in automatic writing was an immediate reference to the fact that this question had been asked before, the name Dorr given, and a

long series of references to the journey to Lethe in Vergil's *Aeneid* (32).

The same general type of phenomena, transcending any explanation in terms of telepathy from sitter to medium, has been extensively studied in the case of an English sensitive, Mrs. Osborne Leonard, with whom research sittings have been held since the end of the first World War. In her case also it has been commonplace to give material unknown to the sitter. Thus Mrs. Hugh Talbott, who states that Mrs. Leonard knew neither her name nor her address, and with whom she never sat before, received from the trance personality ("Fedra") reference to a communicator who wished to identify himself by reference to a dark leather book, containing upon page 12 or 13 a "diagram of languages . . . Indo-European, Aryan, Semitic languages—likewise a table of Arabian languages, Semitic languages"—drawing with the finger lines extending sideways from one center. This made no sense to Mrs. Talbott. But she succeeded in finding a black leather notebook, into which she had never looked, and encountered on page 3 a "Table of Semitic or Syro-Arabian Languages," and "A General Table of Aryan and Indo-European languages" (63, pp. 253-260).

The question of "chance" in such communications is usually regarded as irrelevant (it is hard to see how the conception can be applied in cases like that of the diagram of languages); yet the problem is not hopeless. One may choose a group of sitters unknown to the medium, record messages given to each of them, require each sitter to annotate each item in each record (those of the other sitters as well as his own) as appropriate or inappropriate to his own situation, and apply standard statistics for comparison of genuine hits and "pseudo-hits" (items appropriate for another sitter). In J. G. Pratt's (40) work with Mrs. Eileen Garrett at Duke University, fourteen sitters took turns as sitter, in a room adjoining that of the medium, and not hearing what she said, so that each one, as he scored the record, was unaware which record was intended for him. The results were significant.

CROSS-CORRESPONDENCES

As we noted, F. W. H. Myers died in 1901. Shortly thereafter there began to appear through Mrs. Piper and through several other automat-

ists many Myers-like communications. Frequently an identical or similar message would be given through two widely separated automatists; and there was frequent reference by the communicator, through one automatist, to what had recently happened during sittings for communications through another. At times the communicating intelligence would undertake, either alone or in collaboration with another communicator, to give a complex message through another automatist, as in the "Hope, Star and Browning" episode: On February 11, 1907, the purporting Myers through Mrs. Piper (in the United States) said that he had referred to "Browning . . . Hope and Browning . . . I also said Star . . . look out for Hope, Star and Browning." On the preceding January 23, Mrs. Verrall (in England) had written automatically "rearrange these five letters . . . tears, stare, and on January 28, aster (star) . . . the hope that leaves the earth for the sky—Abt Vogler." Browning's Abt Vogler thus completes the reference. Moreover, when J. G. Piddington went to Boston in 1906 to clear up the matters left in disorder by Hodgson's death, he found among the papers, in Hodgson's writing, stare, tears, aster, etc. Hodgson was one of the group purporting to be helping with this effort at cross-correspondence (38, pp. 59-77).

Many members of the S.P.R. group believed that such communications yielded especially cogent survival evidence, especially because of the rich classical material given appropriately by the purporting Myers; and time may support this view. But since there were many evidences of some sort of telepathic interchange between the members of the group of automatists, and since *some* members of the group possessed considerable classical information, one could, if one wished, extend the hypothesis of "telepathy from the living" to the point of declaring that all the communications, regardless of their form, were of this origin. It was therefore of great interest to note the emergence, in the automatic writing and in other communications, of an evident effort to develop a new method of delivering communications which could not easily be interpreted in this way. The results of the new method came to be called the "cross-correspondences." A cross-correspondence is a coherent message discovered after two or more independent scripts through independent auto-

matists have been studied; no automatist has received the whole message, but the parts, fitted together, make sense. One automatist gives, as it were, a piece of a jig-saw puzzle, a second and a third give other pieces, the integral meaning being discoverable only after the event. Thus Mrs. Verrall in England wrote automatically a description of a painting by Raphael showing Pope Leo prevailing upon Attila to forego the sack of Rome; Mrs. Holland in India wrote "Ave Roma immortalis. How could I make it any clearer without giving her the clue?" (28, pp. 297-303) Frequently a word or phrase is developed in somewhat different directions in the work of two or more automatists; thus two days after Mrs. Verrall had automatically written much Vergilian material emphasizing shadow and umbrae (shadows), and the words "Let Piddington know when you get a message about shadow, Mrs. Holland wrote tenebrae (shades) . . . shadow and light . . . the sundial at Broadmeadows." (38, pp. 222-227).

It has not been possible to achieve by such methods a type of a universally acceptable proof of survival. There is much evidence that the trance consciousness is impelled by the social situation to impersonate deceased persons, and some evidence that the trance consciousness can draw from the minds of other living persons materials essential to the execution of this histrionic task. The difficulties are exemplified in the *Sevens* case (29, pp. 222-263): J. G. Piddington had undertaken to prepare a letter the contents of which he would reveal to no one. The letter contained these words: "If I am a spirit . . . I shall endeavor . . . to transmit . . . the number SEVEN . . . such things as The seven lamps of architecture . . . we are seven. . . . Seven has been a kind of tic with me ever since my early boyhood." The letter was sealed and stored away, so that as a communicator after death he might indicate his identity by reference to its contents. Actually the contents of this intended "posthumous letter," though religiously kept secret, leaked out in telepathic form, and appeared as a very specific cross-correspondence through six different automatists. Through Mrs. Piper came: "We are seven. I said clock! Tick, tick, tick!"; through Mrs. Verrall, "the sevenfold radiance" . . . "we are seven," "many mystic sevens"; through Mrs. Verrall, "the seven hills of Rome"; through

Mrs. Frith, "the mystic seven"; through Mrs. Holland, "there should be seven in accord"; through Mrs. Home, "seventy times seven." Of course it is not stated that this excludes the action of the deceased; indeed, the material is interwoven with Myers material, and is claimed by the purporting Myers as a triumph. Yet we must recognize that "telepathic leaks" of the sort that occurred from Piddington's mind may be going on between all the automatists. If, then, the automatists should all tend, at an unconscious level, to pose as deceased communicators, and if they are in telepathic rapport with one another, final proof of an independent intelligence is hard to devise.

The cross-correspondence method involves, as it were, collaboration among the living. There has also been evidence, as noted, of an intended collaboration among the deceased. The message takes the form of an utterance prepared by two or more communicators; the communicators seem determined to make a statement not derivable from the mind of any one person but intelligible on the hypothesis of a merging of their efforts after death. The best example of such collaboration is the *Ear of Dionysius* (1). Through Mrs. Willett, who was not at all a classicist, came in Mrs. Verrall's presence, this script: ". . . a place where slaves were kept—and Audition belongs, also Acoustics. Think of the Whispering Gally (sic) . . . One Ear, a one-eared place . . . to sail for Syracuse." At a sitting a month later came: "Add one to one One Ear X (sic) one eye . . . entrance to the Cave . . . A Fountain—a trident. Poseidon . . . Chipping . . . it's on stone . . . He was turned into a Fountain that sort of Stephen man . . . they've thought it out together. Father Cam walking arm in arm—with the Canongate . . . a zither . . . a green eyed monster." These items, unrecognized at the time, fell into order upon discovery of the tale of Dionysius, tyrant of Syracuse, who imprisoned his slaves in a stone quarry, alleged to have been a whispering gallery. Here the poet Philoxenus had written a satirical verse, to be recited to the accompaniment of the zither, at the expense of Dionysius, entitled *Cyclops*; in this he represented Dionysius as blind of one eye. The obscure tale had been known to Dr. Verrall, who is represented as communicating. The Aristotelian references which are interwoven with this story are offered as coming from Henry Butcher, a

friend of Verrall's; the two are represented as having contrived the message in collaboration. The excessively recondite materials are apparently to be found together in English only in a book unknown to Mrs. Willett and known only by name to Mrs. Verrall. It is remotely possible that Mrs. Verrall may have been the unwitting source of the *Ear of Dionysius* communication, or that the requisite material was drawn partly from her, partly from other classicists, either in the S.P.R. group or elsewhere. This is, of course, pure speculation. But we are unable to specify just where such telepathy among the living stops, and are therefore unable to specify what type of survival evidence would in fact be convincing.

PROXY SITTINGS

Research on the problem of survival has, however, become more elaborate, and evidence has improved by the development of "proxy sittings" in which the "sitter," who desires to receive communications, is not physically present with the medium. A note-taker conducts the sitting for the distant sitter. Many such studies have been published. C. Drayton Thomas has in many cases acted as note-taker for distant bereaved persons, who have given him a minimum of information about themselves or the desired communicator. In the Newlove case (72), for example, the communicator, purporting to be a boy who has recently died, offers detailed information about himself which was unknown to the note-taker but verifiable by communication with the bereaved, while indeed some of the contents related to incidents in the boy's life of which they themselves were ignorant but upon which information was later collected. Just as in the case of ordinary mediumship, it has been possible to develop mathematical formulae to indicate to what degree the proxy material transcends a chance explanation. The most outstanding result of this type is reported by J. F. Thomas in a volume entitled *Beyond Normal Cognition*, 1937. The formula involves the scoring, as either correct or incorrect, of each item given, and the comparison of hits (statements really appropriate) with pseudo-hits (statements appropriate to some other sitter). Actual results were compared with the results which sheer guessing would give; the hits were of an astronomical order compared with the pseudo-hits.

THE MODUS OPERANDI OF COMMUNICATION

In an attempt to systematize the complex masses of mediumistic data, Richard Hodgson attempted, in his first studies of Mrs. Piper, to treat all communicators simply as secondary personalities of the medium; later, receiving accurate personal communications from his deceased friend G. P. in a manner which to him precluded altogether the possibility of Mrs. Piper's normally acquiring the information, he swung to the view that the trance personalities are in fact the deceased (23). Neither hypothesis seems to do justice to the facts, and Mrs. Henry Sidgwick (62) offered an ingenious alternative hypothesis which time has done much to strengthen. Noting that some sitters received consistently good material, others little or nothing, she undertook to emphasize the role of the sitter in terms of his influence in facilitating the communication of ideas to the medium. In diagrammatic form, one may schematize the communicator as functioning through a subliminal stratum of the sitter's mind, in such fashion that the material reaches the trance consciousness.

Sitter's Supraliminal
Communicator → Sitter's Subliminal → Medium

This is, of course, a theory of telepathy from the deceased. It has the great advantage that the communicators themselves, the entities with whom one talks at the sitting through the medium, may be regarded simply as secondary personalities—a thesis supported by many observations, notably by the evasions, contradictions, and frequently inappropriate behavior and utterances of the personalities. The deceased Richard Hodgson, for example, as purporting to communicate through Mrs. Piper, differs in fundamental respects from Richard Hodgson as known to his research associates. On the other hand, the very large amount of evidential material given by the communicators suggests the possibility that telepathy from the deceased may sift through into the trance utterances. This hypothesis is apparently applicable to Mrs. Leonard and to other mediums as well. But it must be noted that many students of the phenomena believe, in spite of the arguments noted, that some form of actual invasion of the medium's entranced body is effected by the communicators, who struggle, as with a clumsy machine, to make their meaning clear.

The Sidgwick hypothesis regarding telepathy from the deceased may be applied to the proxy cases in such fashion as to suggest that they do not actually alter the theoretical situation. Just as the sitter may act as channel of communication between the deceased and the medium, so the note-taker may act as a channel of communication either from the deceased, or from distant living persons, or both.

Distant Sitter's Note-taker's
Supraliminal Supraliminal
Communicator → Subliminal → Subliminal → Medium

The two Hodgson hypotheses noted and the Sidgwick hypothesis do not by any means exhaust the possibilities; some investigators prefer various other psychological, and indeed various other philosophical possibilities. These cannot be adequately summarized here. Even as to the question of survival itself, data of this order of complexity do not safely lend themselves to any generalization in terms of "sound opinion" or the "consensus of experts." A number of the most competent and seasoned investigators are completely convinced of the reality of post-mortem communication, others completely convinced that paranormal powers of the living are adequate to the task; a large group declines to reach a final judgment on so complex an issue. But no systematic attempt has been made, so far as the writer is aware, to interpret the phenomena without extensive use of some working hypothesis regarding paranormal capacities.

It is, however, a general opinion among those working in the field that the sheer accumulation of more and more evidence of the present types is not likely to solve the problem; they feel that they are working in an obscure area in which there is but limited knowledge of fundamental principles. On this basis it is possible that the larger problems cannot be solved at all except by patient, grubby psychological work on the paranormal powers of the living under well defined conditions, and that, as in the case of physics and biology, sound general principles will emerge only after many decades of patient work by a large number of technically trained investigators. The research on survival continues actively. But as measured by the number of investigations and the amount of research done, the most prominent concern of psychical research today may be said to be (a) the study of those psychological and physiological condi-

tions under which paranormal phenomena, spontaneous or experimental, appear; (b) the devising of special experiments which will give maximum opportunity for these special conditions to manifest themselves; (c) the resulting development of a consistently repeatable technique; (d) the discovery by all these means of the laws or principles underlying the phenomena; (e) the eventual construction of a system of knowledge which will bind these principles together, so that all of the various types of paranormal phenomena will make a meaningful whole, internally coherent and in meaningful and intelligible contact with the general laws of psychology.

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(For a general view of the field, cf. Nos. 35, 44, 76)

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PERCEPTION.—Perception always has been a persistent, and I think we may safely say, a central problem of psychology. In the hands of the classical philosophers it took its importance from its bearing on epistemology with the problem of which it was wholly absorbed. With the empiricists and associationists in their attempt to build up knowledge from concrete instances, perception naturally became a principal means of attaining inductive knowledge. Upon the application of the experimental method in psychology, perception came to be studied as of interest for itself. During the period from 1915 to 1940 its systematic importance increased very considerably under the influence of the tendency toward a realistic attitude induced by widespread application of experimental results in the physical sciences.

In 1920 Professor Titchener (1) proposed Perception as the topic of his graduate seminar and introduced the subject as follows: "For some years past it has been plain that the problem of perception is to be the key-problem of a systematic experimental psychology. We have worked, so to say, on either side of perception: we have worked upon sensation and we have worked more recently upon thought. We have an immense amount of valuable detail, a great store of observed facts; but we have no systematic consensus . . . If you reply that perception has never been neglected, I grant the objection, but I maintain that the study of perception hitherto has been a study within a separate chapter of psychology; the connections above and below have been made speculatively but not experimentally. But now perception shows in a new light; it is systematically central; sensation and thought both alike depend upon the outcome of its experimental analysis. More than that: if we can be sure about perceptions, we shall have laid the basis for a psy-

chology of attention; we shall have gained entrance to the psychology of memory and imagination; and we may even hope—by the explication especially of the elementary motives—to get some insight into the psychology of feeling.

"We reach the heart of the problem of perception when we undertake to exhibit the transformation that the sensory basis undergoes in the making of a perceptive complex. It is, I hope, hardly necessary to say that we shall not regard the transformation as a genetic process of temporal development out of sensory material. The perception comes first in time; the sensation is the outcome of our scientific abstraction. What we have to do therefore, is to analyze psychologically the already formed perception, and to explicate the conditions under which the integration of these analytical factors obtains. We begin with the perception. But when we know the analytical components and the relevant conditions, we can work backwards and reconstruct the perception out of its elements; in that way our problem becomes in a certain sense genetic, though the genesis is logical and artificial rather than chronological and natural. Failure to differentiate the two kinds of genesis has been responsible for a vast deal of confusion and for much needless controversy. We do not, to repeat—we do not derive perception in time from an assemblage of sensory attributes; but taking a perception as it occurs, and analyzing it, we hope to be able to test an analysis by a subsequent synthesis; and that is in its way an affair of generation or genesis."

During the same year, psychologists in this country had hardly completed the assimilation of the considerable literature accumulated in Germany during the war of 1914-18. This contained in a new guise an hypothesis that had its beginnings in the "Form Quality" of Meinong and Ehrenfeld. Max Wertheimer (2) published in 1912 his now historic experimental study of the perception of "movement." In it he brought out the fact that not only is the perception of movement not directly dependent upon the physical spatial translation of an object—Plateau had demonstrated that nearly a century before—but that the experience itself does not consist essentially in those aspects logically implied in the significance of the term, namely space, time and identity of an object. Movement can be

perceived, so he asserted, without experiential reference to any of these, as an immediately given phenomenon. Movement is the direct mental correlate of a short circuit in the central nervous system, presumably in the cortex, between the projection areas of two spatially-temporally separate regions in phenomenal space. In an extreme case the short circuit may take place in the absence of activity in the two primary regions of the cortex, i.e., "pure movement" may be apprehended completely independent of a starting or an ending position of an object. Thus "movement" gains the status of an independent, experiential entity, complete and unitary in itself, with a specific, though hypothetical, physiological correlate that reflects in immediate experience the phenomenally given event. Such is the seed from which Gestalt Psychology grew and it contains the fundamental hypotheses that are of interest in our present discussion. (1) A perception is a complete experiential entity—not a composite of simpler experiences and therefore, in that sense, not analyzable. (2) It is the reflection in experience of a similar (but hypothetical) physiological condition. (3) The physiological condition is itself the projection into the sensorium of an entity of the phenomenal world. The task for Gestalt psychology becomes the enumeration of experiential entities together with their correlated phenomena and their centrally projected processes. Being entities, the former need only to be identified. They are the "Gestalten" in terms of which experiences are to be characterized. Following Wertheimer's establishment of the original movement—Gestalt, many others have been discussed. There are, for example, the various manifestations of "constancy" (3, 4, 5). The fact that the apparent color of an object remains the same under wide variations in color and amount of illumination is designated color constancy. Some of the phenomena are what Hering called "memory color." Likewise, through size-constancy objects appear to retain a true magnitude irrespective of distance. Figure-ground relationships of objects and patterns in the visual field have received considerable attention. Reversible perspective, visual illusions of size and direction, etc., have been included under this interpretation and the concept has been extended and modified to include focal perceptions in audition. Several principles or laws of organization (3) have been worked

out, which govern the formation of figures, among which are proximity, similarity, set, closure, goodness. Categories of this sort make up the conceptual terms used in the discussion of perceptions as mental Gestalten.

Here, then, are the two current systematic positions relative to the problems of perception. They cannot be said to be opposing theories because they are in many ways parallel and supplementary. Their systematic influence, however, has very different effects. Within Gestalt psychology, perception furnishes the prototype of all mental structure or organization. Once established it becomes the *a priori* reference point of the system. In a descriptive psychology, perception holds the important position that Titchener indicated, but it is only one schematic, conceptual device, among many, for organizing the data of observation.

In the present discussion, we shall draw from both systematic positions as it suits our purpose. To begin with, we shall take unitariness of perceptual phenomena as axiomatic. All experience that at any moment stands at the higher level of vividness and is reportably clear, is found to constitute a perceptual unit. Aristotle pointed out that only one "idea" could be in mind at a time, but we have learned much since his day about the possible complexity of such "ideas" or perceptions, and about the unstable stage of attention set up when two mutually competitive perceptions or "ideas" are presented by the situation. It should be made clear at this point that the unitariness of which we are speaking is simply a matter of coherence at the level of the operational data found in the course of its enumeration. We cannot comprehend a meaningful unity or a unity of meaning within our definition of the categories of observation. A datum for science is specified by a statement of the operations by which it is obtained. All sciences have their problems presented to them in the first instance by way of gross epistemological phenomena such as "matter," "forces," life," "consciousness," "experience" and the like. A science rarely accepts such concepts as they stand, but performs certain operations upon the phenomena, which yield data that form the basis for new scientific concepts. In practice, a particular set of operations is incorporated in an instrument which is no more than a machine or a system of phenomena that has been calibrated to give sig-

nificant discriminative pointer readings when it is directed at an event of the real world. Take for example, the thermometer. Casual observation noted that felt temperature and apparent volume are related phenomena. Ingenuity devised a simple machine utilizing these phenomena: a liquid, usually mercury, confined in a tube so that every change of volume is transformed into a relatively large linear displacement of the top of the liquid. Finally, calibration gave a precise significance to every position of the indicating column. Two anchor points, viz., the positions of the indicator when the instrument was placed in freezing, and in boiling, water were determined and the thermometric scale defined in terms of them.

The instrument in a psychological experiment is exactly analogous to, though far less simple than, the instrument of the physicist. While we do not have a complete picture of the structure and function of the biological machine, we can calibrate it and obtain from it data that are directly referable to the operations performed. The whole gamut of psychological methodology from Fechnerian psychophysics to factor analysis concerns itself with calibration of the psychological instrument. In any case, the precision of our data is a function of the operations reflected in the calibration. Applied to perception our calibration is in terms of the sensory attributes. These are neither the casual "sensations" of "private experience," nor mental entities, nor simple items of knowledge. They are the discriminative responses or pointer readings of a calibrated instrument. In terms of such data we can write descriptive formulae for perceptions.

However, such a description must not be confused with the phenomenon itself. It cannot give dynamic function, but only content and temporal course and pattern. One would never confuse a descriptive map with the country through which he is traveling, nor would he expect it to reveal the beauties of the countryside, but the map would give him an orientation that he could get in no other way.

Phenomena as we find them are always meaningful and analysis fails to discover a meaning category of the same order as the attributive ones that we have defined. This is the significance of the statement that meaning is prior to the analysis of experience but not intrinsic to that experience. It is not a general-

ized datum but an added interpretation of a particular experience for a given individual. Meaning, therefore, is subject to explication, to statement and restatement in other terms, but not to analysis. To repeat, meaning is prior to analysis. Meaning epitomizes the implications of a complex unit of experience and therefore meanings constitute the labels by which classification of phenomena can be made. In the nature of the case such classification must precede analysis and description, and it is just here that the Gestalt hypothesis has made its greatest contribution to perception. The conventional classification of experiences on a basis of their meanings into sensations, feelings, perceptions and higher mental processes has served us well, but it is obviously outworn. Moreover, though it originated empirically it is now fundamentally *a priori*. It is this *a priori* classification which the Gestalt hypothesis attacks and for which it proposes to substitute a new classification derived from empirical, sometimes experimental, observation. A reference again to Wertheimer's experiment illustrates this point. According to the earlier empirical interpretation, movement is the spatial-temporal translation of an object and the experience or perception of movement should consist, therefore, in the apprehension of an interrelation of space, time and identity. Wertheimer demonstrates that identity may be lacking, and that space is fixed, in the apprehension of movement under his conditions. Under different conditions other experimenters (6) have shown that apprehension of time may be lacking and that non-visual factors may be introduced—but that is leading us toward analysis. Following Wertheimer's suggestions the Gestalt movement is proceeding with an elaborate, new empirical classification of the meanings or implications of experience, incidentally uncovering many problems for analysis.

We may now consider what the analytic method has to offer. When we direct the psychological instrument upon a circumscribed and controlled set of conditions—a situation—we obtain a report that has two important aspects. First, the data when complete show all the sensory attributes involved in the perceptive unit labeled by a meaning term, which is under examination. Second, the report indicates the mode of interrelation of the attributive aspects. The net result, then, is a structural formula

which is the descriptive equivalent of the perceptive unit and is ordinarily labeled with the meaning term for that perception. It sometimes happens that with the structural formula in hand we can reconstitute the perceptive unit itself. That may, in fact, turn out to be the goal toward which we must work, yet, while a successful synthesis verifies the analysis, its failure betrays a lack of ingenuity rather than an error of observation.

There are three main forms of combination of perceptive units all of which are closely interrelated, so that a particular perceptive experience may include one, two or all three forms.

Primary Integration. When perceptive experiences are brought under conditions of careful observation and are analyzed, particular attributes are found, standing in close relation to one another. Other attributes may be present but may vary without altering the perception. Thus the simplest form of perception consists of a compound or union of two or more sensory attributes into a single unit for experience. This resultant unit has a utility or applicability for the individual that is not present in the elements that constitute it. Frequently it is possible to reverse the analysis and to reconstruct the integration.

The perception of "wetness" (7, 8) offers an excellent example of the simple integrative pattern. First, what does the term "wet" mean? There is no attribute of "wet" in any of the sense departments, though we speak of feeling "wet," of smelling "wet," of seeing "wet," of hearing "wet," and of tasting "wet." This multiplicity of ways of apprehending "wet" is sufficient to indicate that we are referring to some inferred characteristic of an object not to any datum of experience. "Wet" probably means to most people, "the presence of water," though a moment's thought tells us it does not refer exclusively to that substance. We speak also of "wet with blood," "wet with acid," etc. A physical interpretation involves the adhesion of a liquid to a solid. In a specific case we still need to know how "wetness" is experienced, and we must restrict ourselves to one at a time of the various meanings of "wet."

If we examine carefully that aspect of "wetness" which is implied when we say that an object "feels wet to touch," we find that the essential components of the experience are two

qualities, cutaneous pressure and cold. Neither quality by itself feels "wet" and no other quality may be substituted for either. For example, warm water, though practically just as wet as cold water does not give the perception of "wetness." A stimulus which adds the quality pain, or dull pressure will alter the perception. Conversely, the meaning of "wetness" can be set up by any stimulus that brings the two qualities, pressure and cold, simultaneously within the same extent. Thus, if cold, dry powder is allowed to fall gently on the skin, the observer will report "wet." Cooled dry cotton-wool is also felt as "wet"; and the integration takes place even when a pressure spot and an adjacent cold spot are stimulated simultaneously—the former with a horsehair, the latter with a "radiant" cold of carbon dioxide snow. Here we have the integration of two qualities under conditions of identical extent and duration and, of course, with focal vividness. Intensity plays no part in this integration.

In a similar manner the feeling of "oiliness" (9) is an integration of warmth and pressure of a certain extent. As was the case with "wetness," all "oily" substances do not feel "oily" and the perception of "oiliness" can be set up in the absence of oil. Another interesting perception of this type that has been analyzed is "stickiness" (10). This time the integration is of one quality, pressure, and two or more intensities in a particular temporal relation, i.e., a gradual increase in intensity of the pressure followed by a sudden decrease in intensity. Thus the compounding is of quality, intensity and duration. The perception may be synthesized by simply lifting the skin slowly and then releasing it suddenly. This is done either by means of a small tab glued firmly to the skin or by running a thread under a small portion of the scarf-skin. The tab or the thread is pulled gently and then quickly released. Several other cutaneous perceptions have been analyzed. For example, "roughness" (11) is the integration of several punctiform pressures with extent and duration. The stimulating surface must move with respect to the skin surface. The components of "smoothness" are not as obvious, though as contrasted to "roughness" they consist of uniform pressure over the area stimulated.

Visual perception furnishes many examples of primary integrations, some of which have been analyzed. Ordinarily when we deal with

colors we employ colored surfaces of various sorts. It has been shown, however, that colors are not necessarily perceived on surfaces. (12) Surface implies localization and texture, whereas color in its simplest mode of appearance is a film which has no localization and no special texture. Film colors occur in everyday objects such as thick fog, a patch of sky, the color in the eyepiece of a spectroscope. Colors may also appear bulky or transparent, glossy or lustrous but all such object colors can be reduced to film colors by removing the factors that give localization and texture. Unfortunately, the experimental work has not furnished a formula for the modes of color perception comparable with that for wetness, but apparently "film" approaches a single quality while "surface" and "bulk" involve extent and more than one quality.

Most simple geometrical forms (13) are compounds of extent and vividness, sometimes with a qualitative effect. The two lines forming the apex of a triangle are attributively enhanced, and the base line is vague and grayish. The longer parallel sides of a horizontal oblong are described as blacker, clearer, broader and more intense than the shorter sides. The square and the circle are most frequently described as uniform in quality, clearness, extent and intensity in all parts. Certain reversible figure-ground perceptions are integrations of quality and vividness. When the shaded areas are focal the perception is of dark figures on an unfigured background; when the white areas supplant the shading in the focus of vividness the figure-ground perception is reversed.

Core-Context Perceptions. The pattern of the complete typical perception consists of two parts which are logically separable. The data which make up the perception form a single unit, however, and are as closely integrated or combined as those of the primary integration.

Certain of the sensory data in the perception are directly dependent upon the perceptual object and therefore under direct experimental control. Hence they are called the "core" of the perception. Other sensory processes, usually imaginal, which means that they are not directly controlled, accrue to and are compounded with the core to give the complete perception. These are called the context, and this context is the psychological aspect of the meaning. In the absence of a context the meaning disappears

and the perception is incomplete. Alteration of any part is reflected in the whole perception. An excellent example of this type of perception was demonstrated in the attempt to set up the proper conditions for, and to analyze the perception of, "clamminess." (14) Objects which are ordinarily known as "clammy" such as cold boiled potato, cold boiled macaroni, shelled oysters, angleworms and the like were perceived simply as wet or as cold. When, however, an imaginal supplementation was introduced by reading a paragraph in which "clammy" objects were mentioned just before the presentation of the stimulus, these same objects were perceived as "clammy." For example, a thin-walled rubber tube filled with cold, wet sand was laid upon the hand of the observer just after he had been read a paragraph concerning snakes. An image of the snakes gave the meaning of "clamminess" to the feel of the rubber tube. The pressure and cold from the stimulus forms the core of this perception, the images set up by the paragraph make up the context. The total complex means "clammy." The two parts completely interpenetrate and form *one unitary* experience.

Another example from cutaneous experience is the perception by touch of simple geometrical shapes such as the line, the circle, the triangle, the square. (15, 16, 17) The perceptions of these forms by touch are not primary integrations as are the visual perceptions of them. They can be distinguished from one another readily enough by their feel but the geometrical meanings do not proceed from the haptic integrations. The meanings may be added, however, by anything that sets up a visual or verbal image referring to the particular shape. In the same manner, context may be added to any core. Most examples of "tied-images" are perceptions in which the images illustrated form part of the context.

The core-context form of perceptual compound we have called typical because it is the most universally applicable. Only a relatively few perceptions are of the primary integrative sort but any meaning may be carried by a context; any perception characterized by a meaning may be of the core-context pattern. In this form any sensory quality, extent, duration, etc., may stand in the context and give meaning to another quality, etc., but some types of data seem to serve this function more pre-

dominantly. The haptic qualities that come from the muscles, tendons, joints and viscera play a larger part in our perceptions than we usually appreciate. Many objects that occur in various situations require or mean some sort of movement, and our perception of them implies a response whether or not any action is performed. Such meaning is carried in the context of the perception as haptic qualities which often closely resemble those observed in the actual movement.

Implicit Perceptions. Many times when a perception has occurred frequently, it becomes reduced to just those imaged or intended movements mentioned in the preceding paragraph. If you are accustomed to drive a car and chance to be merely a passenger, you continue to push on the brake and pull at the wheel, in short, to drive the car even though you are not in the driver's seat. Thus a great many perceptual experiences appear at first examination to defy psychological analysis. The pattern seems even simpler than in the primary integrations, but the mere combination of the elements presented is not sufficient for the full meaning which attaches to it. We have something that appears to be a perceptual core without a context but fulfilling a meaningful function. Such perceptions always have a long past history in the observer's experience and the meanings are usually expressed in some sort of action or judgment. One turns the proper corners of a familiar street "automatically," one says; one buttons his coat "without thinking"; one judges the rate of an approaching car at a glance. These perceptions have degenerated from the full core-context pattern; the context has dropped out and the meaning is carried by a functional set of the nervous system called a *determining tendency*.

Such implicit perceptions, or direct apprehensions, form part of most of our complex perceptions. They are present, for example, in many judgments of visual size, and direction. In the Müller-Lyer illusion the judgment of the distance from arrow point to arrow point is influenced by the tendency to take each part of the figure as enclosing an area and consequently the two halves of the line appear unequal. The tendency to take all angles as right angles set in three dimensions is the basis for many distorted judgments. The lower end of an oblique line appears tipped up from its true position because

the acute angle is implicitly judged larger, and the obtuse smaller, than each actually is. The upper extension of the oblique is distorted in the opposite direction. The same determining tendency is involved in other "illusions" of direction.

The way in which we take account of illumination in our perception of the colors of objects is so ingrained that it has not yet been traced to its source, but its effect has been demonstrated and measured under many conditions. The phenomenon has been called "memory color" and "color constancy" because when an object is shown under a colored light it will not appear colored in the way that a physical examination would lead us to expect, but will tend to maintain its known color quality independent of the illumination at the moment. If, for example, we set up two gray discs alongside of one another but so screened that one is lighted by daylight and the other by the light from a red electric bulb, we can compensate for the red from the bulb by adding red to the other gray disc and so bring the two to a match. However, if we first set up a screen with two small holes in it so that the observer can see only a small patch of each color and ask him to match the two colors, then when we remove the screen so that he can see the whole arrangement, though the color reflected from each disc is the same in both cases, the one with the red illumination will not appear nearly as red as the one which matched it in daylight when the reducing screen was in front of both. In a similar manner, we neglect the effect of shadows to such an extent that a white paper in shadow is still seen as white though the light reflected from it is less than that reflected from black paper in good light. Many such implicit factors enter into most of our perceptions.

Complex Perceptions. By far the majority of perceptions at one time or another involve all of the forms of perceptual patterning. Perceptions are derived in the first place from everyday phenomena and are named for their meanings or uses without reference to their psychological aspects, their data and their patterns. When we undertake the study of a perception designated by a meaning name, we have before us a problem that requires examination from many angles. Several perceptions have been subjected to such extensive experimental inves-

tigation. Among them is the visual perception of the third dimension.

Visual Space. Space is so general a form of interpretation that there is a strong tendency to put all of our experiences into it. Many times it seems to be an elementary datum on a par with the color quality red, or the tone quality C. Yet when we check this immediacy of space, we find it so variable from time to time under the same conditions that we realize its interpretive character. If you live within visible distance of a mountain range, you note that its apparent distance shifts from day to day. On the other hand, one knows that a moving picture is projected on a flat surface, yet one cannot help "seeing" the persons and objects as solid and as moving from near to far, or the reverse, as well as across the flat surface of the screen. Successive investigators have sought to determine the fundamental basis of visual depth. None has succeeded, but each has contributed to our knowledge of the great complexity of factors involved. We may group these factors under five heads.

(1) First we must take into account certain biological characteristics of the perceiving organism. While the sensory surface, the retina of the eye, is limited to the two dimensions, height and breadth, the organism is capable of almost unlimited movement in three dimensions. One may turn about so that depth or distance replaces height or breadth on the retina, or one can move forward into the dimension which is not directly presented in experience. It is on the basis of these characteristics of the organism that the meaning of depth has been built up.

(2) The meaning of depth or distance may be carried by certain implicit cues. Some of these are:

(a) Size. The larger representation of an object appears nearer than a smaller representation. In cases where several objects are involved this factor becomes linear perspective. (b) Interposition. If one object partially obscures another it is nearer than the second. (c) Aerial Perspective. The outlines of the nearer of two objects are sharper than those of the farther. Use is made of this in stage settings where successive curtains of netting hang in front of the back drop and give increasing depth to the stage. (d) Light and Shade. Light is taken implicitly as coming

from above and usually from the right. Thus the high-light on a convex surface is toward the upper right, on a concave surface at the lower left. Often the protuberances and indentations shown in a photograph can be reversed by simply inverting the picture. (e) Movement. Far objects appear to move in the same direction with the observer; near objects, in the opposite direction. (f) Fixation. Fixated objects appear nearer than peripheral objects.

These cues are deeply ingrained implicit perceptions, and are sufficient of themselves to give an adequate apprehension of nearness and farness to objects. It is largely on them that solidity in pictorial art is dependent. Because of their immediacy, most persons have no difficulty in seeing moving pictures in three dimensions. All of them can, of course, be represented on a two-dimensional surface.

(3) The third factor in the perception of depth stands on the border line between a core-context pattern and an implicit perception. The musculature by which the two eyes are directed and adjusted so that both "see" the same object in sharpest detail sets up haptic excitations in so doing, which integrate with the visual excitations. Sometimes we "feel" these excitations as haptic qualities and as such they form a part of the context which gives the meaning of distance. Usually they are not felt, but the distance, for example, of an approaching tennis ball, is judged implicitly, from the shifting of the relative positions of the two eyes. The data which come from pointing the two eyes at the same object are known as the sensations of convergence; those from the focusing of each eye, the sensations of accommodation. (18) Many investigations of this aspect of the perception of depth have been made and these factors have been found to be very accurate and so fundamental that they are present in almost every perception that involves the third dimension, though usually in their implicit form.

(4) The dual nature of the visual organ assists in giving the meaning of distance in yet another way. The two eyes, being set some six to eight centimeters apart in space, "see" two different pictures. The eyes are a part, however, of a unitary visual mechanism which has only a single visual field. The result is that all objects in that visual field should be seen as double except those at the exact distance of fixation. This doubtless is not perceived, how-

ever, as doubleness or as confusion, but integrates into depth. The greater the doubling the greater the distance from the plane of fixation, either farther from or nearer to the observer. It is easy to break up this integration and to see double images of objects not at the fixation distance. If one holds a pencil at arm's length before him, and another about 20 cm. from his nose, either pencil can be seen as double simply by fixating the other.

If perception of solidity depends upon doubleness of vision, it should be possible to present a different flat picture to each eye and to see as a result a single solid picture. (19) So simple and easy is this synthesis that every parlor of two generations ago had its stereoscope and set of slides. The original form of the instrument consists of two small mirrors set at right angles to each other, and two slide carriers. The apex formed by the mirrors faces the observer so that each eye looks into a mirror and sees one of the slides. If these are the two views of a cube seen with either eye, the observer will see a solid, three-dimensional cube. With a little modification this form of stereoscope can be made into a telestereoscope which enhances the apparent distance, or a pseudoscope which inverts the distance of the objects. Substitute a pair of mirrors for the slide carriers and set them parallel with the eyepiece mirrors. In them the objects before the observer appear as they would if his eyes were much farther apart in his head. The perceptual effect is of greater solidity or a model-like appearance. The mirrors can be arranged, also, so that the right eye gets a picture from the left and the left eye from the right. Then objects tend to turn inside out. The same optical results can be obtained by means of prisms and lenses.

(5) When all other bases for the meaning of depth have been eliminated there still remains the filmy appearance of visual qualities which may enter into integrations and give the meaning of depth. Vividness seems to be the other principal attribute in these integrations. Under the simplest conditions they give the perception known as "glassiness" (20, 21) which appears like a section of three dimensional space lying between objects but not necessarily including them. Some of the "impressionistic" painters have succeeded in representing this effect on canvas. It is characteristic of perceptions with a stereoscope but it may be observed by itself

in empty space when the proper conditions of fixation and attention are obtained.

(6) Finally, as the natural outcome of the biological situation mentioned first and of the various perceptual combinations, a tri-dimensional attitude or determining tendency has been so firmly ingrained in the nervous system that the meaning of depth is pre-supposed in every visual perception, and in the absence of the usual depth factors the meaning may be carried by any context which fits the particular case.

Visual Movement. (2, 22, 23, 24, 6) If a person is asked to tell what he sees when an object moves, he will probably say that he sees the object in the course of its changing from one place to another. Logically, movement implies two positions in space and a continuous transition between them. A century ago it was discovered that movement could be simulated with a series of stationary pictures. A picture of an object was presented for a brief interval. There followed a short blank interval and then the object was shown again in a new position adjacent to the first, and so on, alternating blank interval with new position. The proper sequence was obtained first with a machine called a "wheel of life" and later a stroboscope. It consists of a disc with a number of radial slits rotated in front of a mirror. On the side of the disc facing the mirror are drawn the several pictures, one position for every slit. When an observer looks through a slit into the mirror, he sees the reflection of one position of the object. As the disc rotates this is cut off, he sees only the disc for a moment, then the next slit moves into view and he sees the next position of the object. The device, obviously is a rudimentary type of moving picture machine.

When, in order to make the situation simple enough to be observed adequately, the objects are reduced to two lines in different positions, the movement seen between the objects consists of a flash of gray. (22, 25) This simplest type of movement perception is an integration of gray and brief duration. Contrary to previous supposition, extent remains constant and is not involved in the integration. The source of the gray is the projection, upon the background of the lines, of the central gray which is always seen in the absence of, or mingled with, all colors but which appears by itself under special

conditions. The integration is of a simple form but since under these conditions the quality is projected upon the field and not derived from the stimulus, the perception falls upon the border line of the next higher category (core-context). With a physically moving stimulus the gray is supplied by a weak positive after-image set up by the moving object. The psychological data under the two sets of conditions, i.e., physical movement and two stationary positions, are so nearly identical that an observer can scarcely distinguish between them. (26) When he does so it is in terms of speed and regularity of the movement. The successive stimuli give a better perception of movement than does the physically moving one.

Although perception of movement can be reduced to a primary integration, under some circumstances this meaning is carried by a context. In the course of some of the investigations of movement, observers reported that while they did not "see movement" the perception "meant movement," and this meaning was carried largely in verbal-motor or other haptic sensations. That is, they felt themselves saying, "There, there," or they felt or imaged a movement of a hand or foot, or of the whole body. These sensations or images "made the lines seem to move."

Finally, the meaning movement may be implicit in the stationary representation of an object. The relation of streaking lines to visual perception of actual movement by a primary integration is obvious and although these figures cannot be said to give a perception of movement they do imply or mean movement.

Time. The concept of time is simpler in many respects than its mental representation. Whereas time for physics is always past or future with the present only an infinitesimal dividing line between them, in experience it appears either as time going on, the present, or as time past. The mental present is but another aspect of the focus of attention. "Now" may be said to include all data that are at maximum vividness and to last as long as that vividness. When they are replaced by other data they become "then."

The perception of short intervals of time (27) is dependent in some degree upon the length of the mental present. An observer is presented two time intervals marked off by three short sounds (three flashes of light, or three touches),

from one-half second to three or four seconds apart. He is asked to state whether the interval between one and two is the same as, or different from, that between two and three. His judgments are most accurate when the intervals are about one second long. When the first interval is shorter than this he overestimates it or judges it too long, when it is longer than one second he underestimates it. Apparently, what he does is to stretch it or clip it to fit into a single mental present. His region of greatest accuracy gives a fair measure of his mental present, and this we see agrees closely with the normal duration of attention, i.e., about one second.

Just as the duration of attention may be lengthened considerably under certain conditions, so also does the length of "Now" depend upon the perceptual pattern. If a continuous tone is compared with two spaced clicks the former is underestimated; the latter "empty time" seems longer than the "filled time." When the observers describe the two perceptual patterns, however, it turns out that neither time is "empty." Each temporal perception is an integration of protensity with quality. In the one case the quality is tonal, in the other case it consists of haptic qualities from the viscera and muscles. The greater variety of the latter may possibly account for the longer perceived duration of that interval.

The same sort of thing happens with extended intervals of time. During a period in which a variety of perceptual situations succeed each other rapidly, the protensity integration does not take place readily, if at all, and time seems to be going rapidly. One is scarcely aware of the passage of time. Only events are happening. If the perceptual situation remains fairly unchanging for the same length of time, the haptic protensity-quality integration arises in the absence of other data and one experiences time as progressing slowly. The hour of sight-seeing in a busy street seems much shorter than the hour spent in a way-station waiting for a train. However, when we look back upon the past and make a temporal judgment about it, the perceptual estimation is reversed. The meaning of time is carried now by an imaginal context and the judgment will be determined by the variety of data that enter into this context. The events which went quickly in the first case form the basis for an *a posteriori* judgment of the time in which they took place; whereas the

temporal perception of the long wait is retained scarcely at all.

Magnitude. (28, 29, 30) Perceptions of size and intensity play an important role in our everyday experience. In addition, the example of the dominance of mensuration in the physical sciences has led to an emphasis of that field in psychology which has produced the specialized branch known as psychophysics and the elaborate application of statistical procedures.

Intensity or magnitude is a concept, a meaning like time and space, and there is no single perceptual group that is exclusively peculiar to it. Under carefully controlled experimental conditions magnitude may take the form of a simple integration in which intensity is primary; for example, in the comparison of two simple tones. If two vibration frequencies differing only in amplitude are sounded in quick succession, a simple integration of protensity and intensity is set up for a trained observer in the form of an "intensive step" perception. In other situations intensity judgments are based upon the integrations of groups of qualities. The difference in magnitude between two weights is judged from the two simple integrations of haptic qualities from the skin and muscles involved in lifting them. The judgment of the length of a line is a somewhat more complex perception that may be of the core-context pattern. It consists of a simple integration of quality and extent to which sensations from eye movements add a context. All such patterns are closely correlated with the magnitude of the stimulus. However, the tendency of observers to judge magnitudes on the bases of contexts that have no relation to the degree of the stimulus is the source of the greatest difficulties in such experiments. Unless they are carefully trained, observers will compare the intensities of tones in terms of a context of the clicks made by turning the tones on and off, or the visual images associated with the tones. They will perceive a weight as heavier from its size, from its color, or from the sound made in setting it down. They will judge the length of lines from tiny marks or smudges on the background. This illustrates again the versatility of the core-context pattern of perception.

While there is no single pattern for all perceptions of magnitude the quantitative results of psychophysics indicate a constant type of relation between the degree of a stimulus and

the perception it sets up, and suggests a fundamental similarity among all perceptions of magnitude. Whenever you wish to increase a perceived magnitude by a given amount it is necessary to add to the stimulus a certain proportion of that stimulus. The absolute amount added will be greater, the larger the stimulus is, with which you begin. If one light is on in a dark room, a second light will not necessarily double the brilliance of the illumination. The addition to a light stimulus of $1/60$ of itself gives a just noticeable increase of its magnitude so that, if the original stimulus is of 6 candle power, the addition of .1 candle power will be perceptible, but to produce a noticeable increase from a light of 60 c.p. requires the addition of 1 c.p., ten times as much. This explains why stars are not visible in the daytime sky. Sound intensities require a much larger proportion of change, that is, the absolute power (Watts/cm²) must be increased by .75 of itself to be heard as louder. (31)

This law was first discovered in the field of haptics by a German physiologist, E. H. Weber, and named for him by Fechner who extended the observations to the perception of lifted weights and formulated the law as the logarithmic equation $S = k \log R$, in which S stands for the perceived magnitude, k a constant peculiar to the perception and R the degree of the stimulus. Since then some form of Weber's Law has been shown to hold in practically all perceptions of magnitude. Originally the investigators assumed that they were making direct measurements of attributive intensity, but it is recognized now that the perceptions from which the judgments proceed are more complex and that the measurements bear a relation to intensity, similar to that between the range of attention and the range of report.

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PERFORMANCE TESTS.—Performance tests might be any tests requiring overt response. In practice, they have come to mean tests which can be given without the use of language, either oral or written, or abstract symbols such as words or numbers by either the subject or the examiner. A *performance scale* is a battery of performance tests, the scores of which can be combined in such a way as to yield a total score that can be translated into an I.Q. or a Percentile Rank, or a Personal Constant or some other index of brightness.

The development of performance tests and performance scales has been stimulated largely by the felt need of some means of measuring ability independent of language by those working with the deaf, with the foreign born, with the individual handicapped by speech defect, and with the individual from a cultural background so different from that of the groups against which the Binet scales were standardized that the Binet scales could be used only to measure his level of attainment rather than his ability. In addition to these uses, performance scales are being utilized increasingly at the present time to give balance to the ratings of verbalistic subjects who tend to rate high on the Binet and other scales involving a large amount of informational material, but have difficulty in achieving according to the predictions based on such ratings.

The early attempts to measure brightness by means of psychophysical tests of sensory capacity aimed at obtaining a measure of native ability relatively unaffected by culture. Elaborate apparatus, procedures involving verbal instructions in some cases rather elaborate, and lack of adequate criteria of brightness combined to produce results that convinced psychologists that brightness or "intelligence" could be measured more adequately by means of a different approach.

Spearman, however, in 1904, (1) with improved methods for the calculation of correlations and by the use of more factors for the determination of general intelligence, found large correlations with general intelligence for discrimination of grays, and weight, and pitch.

Norsworthy's (2) use of the Seguin form board as a test instrument, reported in 1906, represented a different approach to the problem of the measurement of mental ability with non-verbal and non-arithmetic material. Goddard (3) made some important changes in the arrangement of this form board. Twitmeyer made still further changes. It was the Twitmeyer modification of the Seguin form board that Sylvester (4) used in his standardization.

In 1911, Healy and Fernald (5) published a battery of tests, some verbal and some non-verbal, including picture puzzles and form boards.

Knox, (6) in 1914, reported A Scale Based on the Work at Ellis Island for Estimating Mental Defect. This scale included many verbal elements but also included the Knox Cube Test, which later was expanded and standardized by Pintner. (7) Also included in the Knox scale were several form boards. At about this time many other tests of the form board type were coming into use.

Healy, (8) in 1914, reported a Pictorial Completion Test. This differs from the form board type of test in that any one of 50 blocks will fit into any one of 10 apertures cut in a brightly colored picture. The task is to discover the relationships portrayed in the picture, and to find the block for each aperture that will best complete the situation portrayed. This test was so successful that it was followed in 1921 by the Healy Pictorial Completion Test II. (9) Scores obtained with these tests appear to correlate with language ability more closely than many of the other non-verbal tests. It is interesting that in A Manual of Individual Mental Tests and Testing in 1927 by Bronner, Healy and Lowe, (10) these pictorial completion tests are classified under "Language and Ideational Tests." These tests can be given without the use of verbal instructions, but reflect the culture of the group in which they originate to a degree that renders them of little value for use in groups that differ widely from the standardization group in cultural background. (11)

In 1915, Porteus (12) published the first de-

scription of work with his maze tests. The Vineland Revision (13) was published in 1919, and the New Series of the Porteus Maze Tests (14) appeared in 1933. In 1942 Porteus published a report on Qualitative Performance in the Maze Test (15) that indicates the usefulness of performance tests for the observation of behavior under standardized conditions.

Kent, in 1916, published (a) A Graded Series of Geometrical Puzzles (16) and (b) A Graded Series of Picture Puzzles (17).

Wallin, (18) in 1916, in his work with the Seguin form board, made use of "half-yearly" norms up to the age of 8 years. He used year norms above the 8 year level.

The Army Performance Scale, (19) 1921, was "designed during the World War (I) to test foreigners, illiterates and those who had failed on the Alpha and Beta examinations." A correlation coefficient of .84 was found to obtain between performance ratings and Stanford-Binet mental ages.

It should be noted that reports using correlations between mental ages quote values considerably higher than those in which correlations between I.Q.s are presented.

A report on the Ferguson (20) form boards was published in 1920. Although verbal instructions were used, it was stated that the form boards could be presented without the use of language.

The first report of the Kohs Block Design Test (21) was published in 1920. A more complete report came out in 1923. (22) The correlation with Stanford-Binet mental age for 366 cases was $.82 \pm .01$. In the Point Scale of Performance Tests, (23) the Kohs Block Design Test showed the highest discriminative value between successive chronological age groups from 5.5 to 15.5 years, inclusive, of any test of the scale except the Seguin form board. Modifications of this test have been used in several of the more recent non-verbal scales.

The popularity of form boards during this period, made it almost inevitable that A Scale of Performance Tests by Pintner and Paterson, (24) 1917-1923, would be overloaded with form board material. This "scale" is not useful as a scale because of (1) the selection of tests to be standardized, (2) the lack of a satisfactory means of combining scores from the separate tests in such a way as to provide a logical method of extrapolation above and below the

limits set by the year norms, and (3) the double weight given to many of the poorer tests by counting the time score and the error score as separate items in computing the average mental age, the median mental age, the arbitrary point score or the percentile rank. Thus, a maximum of 58 points could be earned on the Two-figure form board, which gives evidence of possessing rather low discriminative value between successive chronological age groups, while only 30 points could be earned on the Seguin form board or the Healy Pictorial Completion Test I, both of which have demonstrated high discriminative value.

The Pintner and Paterson Scale of Performance Tests did, however, emphasize the fact that although many non-verbal tests had been scaled, no scale of performance tests had been standardized as a scale prior to its appearance. It also re-stated the principle that "the chronological age of the child is the measure of our test." (25) It might be added that chronological age still remains the only objective criterion of native intelligence from infancy to adulthood. The Pintner and Paterson Scale of Performance Tests is still useful as a handbook for the 15 non-verbal tests that it reports.

Another approach was made to non-verbal testing in 1926, by Goodenough in "The Measurement of Intelligence by Drawings." (26) Verbal instructions have been used for this "Draw-a-man" test. For non-English speaking children, instructions have been given through an interpreter. (27) For use with deaf children, norms are needed for drawings obtained without the use of verbal instructions. For chronological age groups 4 years to 10 years, inclusive, a correlation of .76 with Stanford-Binet ratings is reported.

In 1928, Drever and Collins published their Performance Tests of Intelligence (28) designed especially for use with deaf children. In 1936 a second edition appeared. (29)

In 1930 A Point Scale of Performance Tests (30) by Arthur was published. Form I of the scale had been standardized against a population of average American school children: approximately 100 at each chronological age level from 5 years to 15 years, inclusive. Form II had been standardized upon only 535 cases and was less reliable. Form I is one of the first scales reported on which deaf children are able to earn ratings comparable to those earned by hearing

children. Pintner (31) had reported in 1928, "The mental alertness of the deaf as measured on the Pintner Non-language Tests was on the average about three years behind hearing children of the same age." In contrast with this, Bishop (32) reported in 1936, "For the ninety children studied, the intelligence quotients on the Arthur Performance Scale ranged from 152 to 68. The interquartile range was from 84 to 106. The median was 97, the mode 97 and the mean 97.16 for the group." The children examined constituted "as nearly an unselected group (from the standpoint of intelligence) as one can find in the general school population."

A modification of Form I is the first scale used in measuring the ability of American Indian groups to yield an average rating comparable to that of the group against which the scale was standardized. In a survey carried out by the United States Indian Service (33) with the cooperation of the University of Chicago in 1942, 670 Indian children were tested in eleven communities of six different tribes. The mean I.Q. was 100.11 as compared with a theoretical mean of 100. Judging from these results, the modified Form I appeared to be "culture-free." Cattell, (34) Feingold and Sarason in 1941, in their search for a culture-free intelligence test state that of the tests investigated "the A.C.E. seems most susceptible to cultural influence and the Arthur least." The authors report of their own Culture-Free Intelligence Test II, that it "is shown to be as valid as the Terman-Merrill and as culture-free as the Arthur: it is the only scale that combines both of these advantages."

Loudon and Arthur report that patients with a reading disability described by Hinschelwood (35) as "Congenital Word Blindness" tend to earn a rating on Form I of the Point Scale of Performance Tests that agrees more closely with the Binet rating obtained after satisfactory reading skills have been developed than does the Binet rating obtained before they have learned to read. (36)

Comparison of 974 I.Q.'s obtained on Form I, with I.Q.'s obtained by the same subjects on the Binet shows a P.E. (37) (Otis formula) of less than five points at all levels except 12 years, 15, 16 and adult. At the upper levels the performance ratings tend to run higher than those obtained with the 1916 Stanford-Binet. This is obvious from the upper Q values as well

as from a comparison of the medians, and can be attributed to the low ceiling of the Stanford-Binet. For 25 subjects tested on the Terman L and on Form I, the median Binet I.Q. was 143. The median chronological age was 19 years 7 months. The highest I.Q. earned on the Terman L was 162; the highest earned on Form I was 185. The correlation between the two sets of I.Q.'s is about that generally reported between verbal and non-verbal scales: $r = .73 \pm .09$. (38)

The assertion has been made not infrequently that dull subjects tend to rate higher on performance scales than on the Binet. For 432 dull subjects who had earned Binet I.Q.'s below 95, the median algebraic difference between the Binet I.Q. and the I.Q. on Form I of the Point Scale of Performance Tests was ± 0 . (39) There appeared to be no general tendency on the part of those dull subjects to rate higher on that performance scale than on the Binet. For 111 bright subjects, all of whom had earned an I.Q. of 115 or above on the Binet scale, the median algebraic difference between the Binet I.Q. and the I.Q. earned on Form I was $+ 1.0$. There appeared to be no general tendency for bright subjects to rate lower on the performance scale than on the Binet in that investigation. (40)

Atkins, 1931, published a report on An Object Fitting Test for Young Children. (41) It was carefully standardized for use without verbal instructions. The norms are based upon 150 tests at each year level from 2.5 to 5.5, inclusive.

The Alexander Performance Scale, (42) 1932, includes three tests, one of which, Alexander's Passalong Test is a manipulative puzzle standardized as a test for the upper age levels.

The Minnesota Pre-School Scale, (43) 1932, by Goodenough, Foster and VanWagenen was divided into (a) language scores and (b) non-language scores. The language scores were given double weight, originally, in the belief that language tests possess a higher predictive value for future brightness than do non-verbal achievements. A report on the predictive value of the Minnesota Pre-School Scale (44) by Goodenough and Maurer, 1942, states that in practically all comparisons the non-verbal scale of both forms, though shorter and therefore less reliable, was found to be a little more closely related to all later tests than was the verbal scale. This report resulting from a careful and

detailed study of predictive value was recognized as a distinct contribution to the field of non-verbal testing, even though the scale under consideration cannot be used for deaf or non-English speaking children without modification.

The Cornell-Coxe Performance Ability Scale, (45) 1934, is "capable of presentation by non-verbal methods." It includes seven tests, most of which were included in the Army Performance Scale. The authors reported a correlation of .79 between Stanford-Binet mental ages and ratings obtained with their scale for 306 pupils from kindergarten through the eighth grade.

In 1936 the Ontario School Ability Examination (46) was prepared for use with the deaf or non-English speaking child, and those "who for any reason are lacking in language facility." It was tried out with deaf and with hearing subjects, then given to 288 deaf students ranging in age from 5 to 22 years. The author states that the results form "a fairly normal probability curve about the median 94." "Compared with tables for hearing children, the I.Q. table for deaf children suffers a more or less uniform shifting of six points to the left."

The Leiter International Performance Scale, (47) 1936, approached the problem of intelligence measurement from the same angle as the Binet. Beginning at the 2 year level, four tests are presented at each year level up to and including 18 years. The entire scale has been standardized without the use of any language. Norms have been established for 710 Chinese, 720 Japanese and for African native groups as well as for "Caucasian" children. Mental age is calculated as it is in all scales of the Binet type. "The correlation of this performance test with Binet is .79."

The Wechsler-Bellevue Scale, (48) 1939, resembles the Minnesota Pre-School Scale in that it is made up of two independent scales, a verbal and a non-verbal. A significant contribution to the measurement of adult intelligence is the table (49) equating average reaction levels at chronological ages of 20 years and above with average reaction levels at chronological ages below adulthood. According to this table, the average reaction level of the individual 20 to 24 years of age is equal to that of the average individual 15.5 years of age, while that of the average individual 55 to 59 years of age approximates that of the average 12 year old.

These values, when verified for a wide sampling of groups by other investigators should be as valid for any other scale used for measuring adult intelligence as for the Wechsler-Bellevue for which it was constructed. The author states, "The median difference between Performance and Verbal I.Q.s for our scale is approximately 8.7 points"; and $r = .71 \pm .018$. (50)

In a Comparison of the Wechsler-Bellevue, Revised Stanford-Binet and American Council of Education Tests at the College Level, (51) results were reported for 112 college freshmen. "The Wechsler-Bellevue verbal scale correlated more highly with the other measures than did the Wechsler-Bellevue full scale, while the correlation of the Wechsler-Bellevue performance scale with the other tests was so low (.19 — .39) that doubtful validity at the college level is indicated."

The Carl (52) Hollow Square Scale, 1939, was developed from the Hollow Square Test (53) by Dearborn, Shaw and Lincoln. It is designed for adults and for children over 10 years of age. The directions are said to be difficult for younger children to comprehend. In spite of this, the author states that the test lends itself easily to use with the deaf and dumb through pantomime directions. For 521 adults the correlation ("adjusted Pearson r ") between Stanford-Binet I.Q.s and I.Q.s obtained on this test was $.785 \pm .011$, while the P.E. of estimate was 7.49.

In 1944, A Non-Verbal Test of Logical Thinking (54) reported a stencil design test that utilizes a third dimension in constructive thinking. It was devised to replace the Kohs Block Design Test in the Revised Form II of the Point Scale of Performance Tests (55) in order to avoid the high degree of practice effect shown by the Kohs test in retest scores at the higher age levels. This Stencil Design Test gives evidence of measuring general ability at age levels 4.5 to 15.5 inclusive, and also of indicating special ability in fields demanding logical thinking. Because of the spatial relations involved in the problems presented, it gives promise of usefulness in psychiatric clinics.

The Revised Form II of the Point Scale of Performance Tests shows a correlation of .78 with Binet I.Q.s for 171 subjects.

During the period of development of non-verbal scales made up of tests of the manipulative type, a variety of non-verbal tests of the

paper and pencil type were being published. Among the earliest of these was the Pintner Non-language Test. (56) Among the most carefully presented from the statistical standpoint is the Culture-Free Intelligence Test (57) by Cattell and his co-workers. The advantages of the paper and pencil non-verbal tests presented by pantomime are the convenience of the material, the possibility of use as group tests, and ease of scoring. The disadvantages are the frequent use of unclear drawings and of drawings too small to see with ease, the monotony of the task when successive tests all depend upon visual discrimination of small differences, and the lack of opportunity to observe the subject in a variety of situations.

With the development of the Binet scales, the standardization of performance scales and the publication of standardized tests of school achievement, the study of test "profiles," and of patterns of success and failure on tests of different kinds of ability was initiated. In these, ratings on separate scales were studied as parts of a composite whole and not as isolated facts. The reports of Bijou, (58) of Arthur, (59) of Wechsler (60) and other investigators have indicated the usefulness of performance scales in studies of the intellectual organization of subjects presenting problems of adjustment.

In a study of Primary Mental Abilities (61) in 1938 by Thurstone, 56 psychological tests, some verbal and some non-verbal, were given to a group of 240 volunteers. The scores were treated by multiple factor methods. The preface to the report states "When this study was planned, we postulated a number of tentative psychological categories or factors—the primary factors that have appeared have a general relation to the tentative categories with which we started, but they are not identical with the tentative categories. We had postulated a verbal factor, but we found two distinct verbal factors in the analysis. We found that the number factor is highly restricted. We had postulated different reasoning factors for verbal, numerical and spatial relations, but this tentative classification was not sustained. The reasoning tests revealed two factors that we have called "induction" and "deduction," the latter being less clearly indicated than the inductive factor. These reasoning factors seem to transcend the immediate characteristics of the material of the tests." It is studies such as this that assure the psychologist experi-

menting with performance scales that a wide variety of abilities can be measured without having recourse to verbal material.

Most tests are "trade tests" in that they are devised to measure ability from the point of view of some practical purpose. Modern statistical method is being applied in the search for valid criteria for the specific purposes to be fulfilled. The more specific the purpose and the more nearly valid the criterion, the easier becomes the task of gauging the usefulness of the test.

When tests are available for measuring accurately many abilities from many different angles, psychologists may be able to formulate more clearly the problem of measuring general intelligence both with verbal scales and with performance tests. In spite of recent progress, the measuring of intelligence, as a science and as a profession, appears to be still in its early infancy.

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PERSONAL DOCUMENT ANALYSIS.

—Civilized human beings are, without exception, document makers, and recording experiences in symbolic forms constitutes a large segment of human behavior. Nevertheless, psychological document analysis to date performs only a minor role in the field of psychology. Clearly, the contradiction between the availability of subject matter and the minor use of it must be overcome sooner or later. As Dr. John K. Benton once observed, "The academic psychologist characteristically scales down his subject matter to the level of his own limited methodology." Psychology, however, is an expanding, self-critical discipline, and some progress in document analysis has been achieved very recently, while there is good reason to predict much greater progress for the near future.

Early in modern psychology's development the personal document was used for three main purposes. First, it was used to illustrate and to probe the psychology of adolescence (Stanley Hall). Second, personal documents were used as data in the psychological study of religious experience and behavior (E. D. Starbuck and William James). Third, document analysis was used in a quasi-clinical context, to illustrate some psychoanalytic theses concerning individual development (S. Freud). These early workers neglected giving any attention to the methodology of personal document analysis, and the methods which they actually employed were incidental.

Also incidental were the methods more recently applied by certain social scientists who

have used personal documents on the one hand to illustrate the introjection of culture, and on the other hand, as data which reveal what personal motives have activated certain social movements. In a recent monograph titled "The Use of Personal Documents in Psychological Science" (1941), Professor Gordon W. Allport contends that document analysis is among the critical areas in which psychology and sociology must develop mediating categories. The monograph mentions such sociologists as Znaniecki and Blumer as having made some preliminary contributions in this direction. Their work, however, must be classified as primarily sociological.

Meanwhile, the depth psychologists have given continuous attention to personal documents. Such psychoanalytic journals as *Imago* have carried essays by many different writers who are interested in the creative secrets of literary, artistic and philosophical geniuses, and who discuss the personal documents produced by such geniuses as possible sources of insight. Yet few serious methodological studies have been forthcoming from the psychoanalytic school. A noteworthy exception was Dr. Harold G. McCurdy's article titled "Literature and Personality," which appeared in *Character and Personality*, 1939, VII. In the first installment McCurdy discussed how the analysis of literary productions and the analysis of the life histories of the men of letters may be reciprocally useful, and in the second installment a systematic analysis of the novels of D. H. Lawrence was presented. This analysis employed such familiar Freudian concepts as "projection," "identification," "symbolization," "condensation," and the "Oedipus complex." Carl J. Jung and some of his followers, such as the English clinician Helton Godwin Baynes, have encouraged their patients to express their personal problems in drawings and paintings, employing media which guarantee some permanence to the work. This type of research converges with the so-called projective techniques, and would not ordinarily be identified with personal document analysis, but it is important to note that the boundary line between the two types of research is somewhat arbitrary.

Dr. Alfred L. Baldwin has investigated the possible use of document analysis in the psychology of personality, properly so-called, and pursued apart from extrinsic interests such as the clinical or the sociological. In an article

titled "Personal Structure Analysis" (*Journal of Abnormal and Social Psychology*, Vol. 37, No. 2, April, 1942), he suggests that the major personal attitudes provide the content most frequently expressed in any intimate and prolonged personal document, and that the frequency of the relation of contiguity between any two types of expressed content is a measure of the association between any two personal attitudes. Baldwin's subject matter for this study was a collection of personal letters written by a middle-aged woman during a period of some eleven years. His analysis, which used the above mentioned principles, was rigorously quantitative and was exhaustive. Such a method would seem to be adequate so far as it goes for the analysis of those documents in which neither deliberate nor involuntary (and, perhaps, "unconscious") disguise of contents or connections plays a part. For those cases in which disguise is operative, symbolic analysis, stylistic analysis and other methods would be necessary as supplements to Baldwin's statistical treatment of the "surface" materials. Of course, environmental contingencies might in some cases cause a document writer frequently to mention matters which concern him only superficially, and so it would seem that frequency, as a criterion of personal importance, should be employed with caution, and some attempt should be made to rule out matters of mere contingency.

Charlotte Buhler, the well-known European psychologist of personality, has derived major conclusions concerning personality from the systematic study of large collections of personal documents. There is little doubt that in the future, collections rather than single documents will receive greater attention than was usual heretofore. Buhler's work was exceptional also in that it stressed the time-dimension of personality. Every life history, as partly revealed through the personal document, was found to involve a few major personal goals and tasks which became increasingly definite with maturation and learning, and which became increasingly unified. Feelings of expanding vitality and personal influence characterized development through young adulthood, but afterwards a greater tendency to surrender to frustrating circumstances became evident. Expansion was found to give way to restriction, and boasting to resignation. Thus Buhler depicts the time-Gestalt of human life along lines which, per-

haps, may be called pessimistic. The personalities which she studied through the personal documents seemed to achieve no full reconciliation between their evaluational attitudes and their mature sense of finitude and personal limitation. It may be asked whether such failure characterizes human life histories generally, or whether some fairly constant factors in central European secular culture and ideology in the middle decades of the twentieth century were responsible for Buhler's findings. Certainly the personal documents studied by William James and cited in his book, *The Varieties of Religious Experience*, would provide basis for quite different conclusions.

A personal document may be investigated primarily as a clue to the productive personality, or it may be investigated primarily as a system of expressions which reveal, or partly reveal, a personal world. Personal worlds, like personalities, have their histories, and indeed, a personal life quest always proceeds within the frame of reference provided by a particular and also changing personal world. Would comparing and contrasting different personal worlds, as expressed through personal documents, be logically equivalent to comparing and contrasting the different productive, developing personalities? A phenomenological analysis of personal documents would contribute to the answer to this question, if an integral phenomenology must be a systematic exploration and description of experience as uniquely personal. True, the phenomenological appreciation of a personal world which is mediated by a system of expressions would be the type of direct awareness which follows partly inferential investigation, rather than being that direct intuition of data which precedes deliberate inference. In no other way could an integral phenomenology be more than mere introspection, but the study of behavior as expression, in contradistinction to its study within a physicalistic universe of discourse, serves truly phenomenological purposes. And personal documents are systematic expressions of personality.

Which documents constitute adequate expressions? That question was considered in R. F. Creegan's article titled "The Phenomenological Analysis of Personal Documents" (*Journal of Abnormal and Social Psychology*, Vol. 39, No. 2, 1944). It was urged that various criteria both intrinsic to the document and extrinsic to it

should be applied in order to estimate how fully the expressions in it reveal the personal world in the first place, and more indirectly reveal the productive personality. The same article suggested that both intuition and inference are legitimate methods in document analysis on the condition that detailed conclusions, however reached, are validated by the phenomenological coherence principle. The personal document was said to provide the following kinds of evidence about the personal world: direct statements, significant contiguities, symbolic interpenetrations, and stylistic correspondences. A complete analysis was said to reveal both formal and material attributes of a personal world, and to reveal both local and more general attributes of both types. Furthermore, that the development of a personal world, as expressed in a temporally inclusive document, involves both material and organizational changes, while the total development sums up many local trends was stressed.

Some examples of fairly general content in a personal world would be the type of values which a person stresses and the type of causality in which he believes. Such factors would be general enough to find expression in many different areas of concrete personal concern. The degrees and types of differentiation and integration of content would be identified as formal characteristics, while such factors as personal directionality and personal distance would be neither exclusively material nor exclusively formal, but organically formal-material. The above mentioned article applied these and related principles in the analysis of a student diary covering four years of college life. The analysis showed that the locus of the personal world progressively changed on several dimensions, each of which indicated variable characteristics which are shared by many personal worlds. As the person faced novel situations and overcame various conflicts, the structure of the personal world evolved.

Personal document analysis is approaching methodological maturity at the present time, and some of the investigations mentioned above mark definite stages in its progress. Continued methodological advancement and a widening range of application for document analysis may be expected primarily because the personal document provides the most conclusive data concerning what may be called the higher stages

of individual development. In the major personal diary, the diversified collection of individual correspondence, the secret autobiographical attempt, and in similar classes of extensive and intimate documents, the person frequently states his conflicting viewpoints concerning values and concerning the relations between his values and reality as experienced and inferred within the frame of reference of the unique life history. And it is these most complex personal preoccupations, these highest levels of personal development, which psychology must explore and understand if it is to make any decisive contribution to the human quest in an era of hitherto unimagined cultural and spiritual conflict and searching.

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PERSONALITY (Latin, *persona*, *personalitas*; French, *personnalité*; German, *Persönlichkeit*; English, *personality*, *person*, *self*).

I. THE CONCEPT IN PHILOSOPHY AND PSYCHOLOGY

The history of the word *personality* reflects the problems encountered by any thoughtful attempt to define its meaning. First used among the ancients for the dramatic mask, it soon became the name for the individual role. It was when the Church Fathers wanted to suggest the nature of the God who expressed himself in three roles that the metaphysical meaning of the term came into being. Thus, when Leibniz distinguished man from animal by calling him

a *person*, or a rational, self-conscious, continuous, incommunicable and unique substance, he epitomized the main philosophical answer to the metaphysical problem of the source of identity and continuity in individual change. We are indebted to Kant for extending the term to its most significant ethical sense, as designating a rational, free agent who should never be treated as a means only.

If these problems of the unity and continuity of individual structure and the ideal of human conduct seem remote from scientific psychology, the connection becomes evident once we recall prolific discussions of the integration of personality, the nature of mental health, and the underlying units of behavior. When psychology decided to free itself from the *mater scientiarum*, it did not soon develop a new vocabulary. For the philosopher, the words *spirit*, *soul*, *self*, *consciousness* have, in the main, referred to the unified, private, non-spatial subject or agent in experience, though much less agreement can be found as to the nature and interrelation of each term. The words *person* and *personality* have invariably referred to that quality of selfhood which was capable of self-conscious rationality and ideals. The student is not hard put to discover in such thinkers as Anaxagoras, Protagoras, Plato, Aristotle, Plotinus, Augustine, Aquinas, Descartes, Hobbes, Locke, Berkeley, Hume, Kant, Fichte, Hegel, Lotze, Renouvier, Jouffroy, Mach, Bradley, Royce, James, Calkins, Brightman, Whitehead, Spearman, Aveling, Stern, and G. W. Allport the fundamental historical concern to explain the unity and multiplicity, continuity and change, identity and difference within human experience. Psychological discussions have sometimes wittingly and sometimes unwittingly moved away from these problems.¹ Psychologists have either assumed the existence of an epistemological or metaphysical subject, or else have repudiated the whole problem as meaningless, and have moved on to the level of description, in the hope, perhaps, that a better solution might be forthcoming.

However, a more reasonable transition from the metaphysical and epistemological to the psychological description of the self was made possible by Kant's distinction between the *subject I*, or pure ego, which thinks and feels, and the *I* which the pure ego knows and feels as its object, the empirical self or *me*. When psycholo-

gists and philosophers challenged the purity, substantiality, and singularity of the self, only the empirical self was left. When the psychologist-philosopher William James suggested that a man's *empirical* self could be considered "the sum total of all that he can call his, not only his body and his psychic powers, but his clothes and his house . . ." ² he was opening the way to the psychological description of personality.

But scientific analyses of personality struggle with the same problems: What is personality? Does it have unity, and, if so, how is this to be construed? What is innate and what is developed, and how? How is the conscious personality related to the unconscious? How are the personalities of others known? Many empirical data have been and are being garnered. The *interpretation* of these data, however, turns invariably upon the psychologist's answer to these fundamental questions. As with philosophers, so with psychologists, all interpretations have been affected by the methodological presuppositions of each investigator. In view of the parallelisms and similarities which exist between the problems, data, description, and interpretation at the philosophical and psychological levels of analysis, one can only deprecate the unwillingness of natural partners to study and understand the contributions of the other.

II. EMPIRICAL BEGINNINGS

When Bacon said, "The first article, therefore, of the culture of the mind, will regard the different natures or dispositions of men. . . . And I cannot sometimes but wonder that this particular should be generally neglected . . ." ³ he was justly chiding scholars and not "the common discourse of men" for neglecting the concrete individuality of persons. Brief note must be taken, nevertheless, of early beginnings.

When Theophrastus, in the fourth century B.C., penned his remarkable "characters," each dominated by a comprehensive personal trait, little did he realize that one day an Adlerian would demand to know a person's *style* of life. Nor did Hippocrates dream that endocrinologists would substitute hormones for humors and insist that the chemistry of the body had indelible effects on emotional disposition.

The physiognomic diagnoses in which both scientists and quacks engaged since Aristotle's observations have led to careful correlation of personality traits and bony structure, muscular

set, and physique. In the phrenological area, Franz J. Gall (1810) was convinced that quantitative variation would account for the individuality of different persons.

Still another characterological strand emerged when A. Bain (1862), A. Shand (1896, 1915), and W. McDougall (1908) rejected intellectualistic psychology and interpreted individuality as the channelization of innate emotional energies. In France, C. Fourier (1822) emphasized not only the *dominant* motives of personality, but also the *manner* of their execution as affected by *tonic* passions. M. de Biran (1887) also reacted against mechanistic associationism and insisted that the self, far more than Hume's series of experiences, is an experiencing, unified agent which becomes conscious of itself as its *will* meets resistance—a voluntarism which was to be developed in Cousin's (1859) doctrine of spontaneity of will, and later in Brentano's (1874) activist concept of mind.

However, it was not until Sir Francis Galton (1884) convincingly challenged J. S. Mill's skepticism as to the applicability of experimental method in the study of personality (not only by the use of statistical and correlational techniques but by the use of experimental controls especially in the study of expressive movements) that the present experimental impetus got under way.

III. THE PROBLEM OF DEFINITION

We have noticed that psychological science is concerned with empirical individuality (*Persönlichkeit*), and not the inner unity-giving person (*Personalität*). But nothing like agreement as to the definition of personality is to be found either within academic halls or psychoanalytic clinics. D. W. MacKinnon has observed:

"American psychologists have tended to emphasize the parts or units which, summed or integrated, could be thought to constitute personality, especially those elements which they had reason to believe were common to all individuals. . . . German psychologists, on the other hand, have been more inclined to think of personality as a unique whole which cannot fruitfully or legitimately be analyzed into smaller component parts."⁴

Convinced that uniqueness cannot be described or explained, German psychologists have

turned either to typologies or to the understanding of a personality in its cultural and historical setting. The work of G. W. Allport in America, in its insistence that psychology develop a methodology which can take account of individuality, is at once a critique of purely nomothetic analyses, of typologies, and of intuitionistic accounts. But here again differences in the conception of psychological science reflect in turn differences in conviction on the mind-body, teleology-mechanism, heredity-environment, and man-society problems. These conflicting tendencies pervade the following survey of definitions.

Atomistic trends are exemplified in Prince's definition of personality as "the sum-total of all the biological innate dispositions, impulses, tendencies, appetites, and instincts of the individual, and the acquired dispositions and tendencies—acquired by experience."⁵ This enumerative or *omnibus* conception is transformed once attention is focussed on the functional order in mental life. Thus H. C. Warren and L. Carmichael emphasize the *integrative* aspect:⁶ "Personality is the entire mental organization of a human being at any stage of his development. It embraces every phase of human character: intellect, temperament, skill, morality, and every attitude that has been built up in the course of one's life." When, in turn, the inner order of personality is conceived of as hierarchical, as in James' classical distinction (1890) of the material, social, spiritual, and knowing selves, *hierarchical* definitions result. However, writers like McDougall, Bridges, Martin, Blondel and Murray emphasize a hierarchical organization of purpose. The *biological* and *behavioral* emphasis is found in definitions like those of J. B. Watson, C. N. Rexroad, E. J. Kempf, A. O. Bowden and L. Shaffer (see section X), which stress adjustment along with integrative or omnibus structure. The *social* type of definition stresses the cultural setting of personal development. Thus L. Marcuse: "Personality is the convergence of all essential, cultural tendencies in one mind. The more culture one has, the harder it is to be a single personality."⁷ But thinkers like M. Schoen realize that: "If all the members of any one social group acted alike, thought alike, and felt alike, personality would not exist."⁸ Accordingly, they emphasize the social distinctiveness of the individual, and with R. H. Wheeler see personality as "that particular pattern or balance of organized reactions

which sets one individual off from the other."⁹ Since all of these definitions conceive of personality as a product of learning, it is easy to see why R. S. Woodworth was led to deny personality any substantive intent and give it a purely adverbial meaning, thus: "Personality refers not to any particular sort of activity such as talking, remembering, thinking, or loving, but an individual can reveal his personality in the way he does any of these things."¹⁰

A *personalistic* definition which synthesizes the hierarchical, integrative, adjustive, and social contributions, while stressing uniqueness, is that of G. W. Allport: "Personality is the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment."¹¹

It may have occurred to the critical observer that a serious ambiguity lurks in all of these definitions; namely, in the word *individual*. It is the individual's personality; it is the individual's learning, or mode of adjustment. Clearly the individual is not at once the personality learning and the personality learned, the original adjuster and the adjustment made, the organizer and the organization produced, the unifier and the acquired unity. The philosophers, we recall, faced this problem of subject-object, of identity persisting through change, in their doctrines of the soul and self. The informed psychologist, offended by unempirical formulations of substantive selves, deserted the problem and seems to have stretched the question-begging term "individual" over the lacuna. The uninformed psychologist has read somewhere that theologians and philosophers (who, of course, deal only in unempirical speculations!) concern themselves with the soul and the self, so he concludes that this problem cannot possibly concern him as a scientist. But it would seem that the psychologist who would speak clearly not only to his comrades but to readers who care to know more about themselves as persons than about the future of technical psychology should at least offer some exposition at this point. Would that the problem were only one of language! As long as acute psychologists realize that "the crucial problem of psychology has always been mental organization (association)," ¹² some sort of agent-subject needs to be included within the psychologist's "frame of reference." James Ward and McDougall among the British, Lotze and re-

cently Stern among the Germans, Brentano among the Austrians, Renouvier among the French, and Mary W. Calkins were convinced that psychology could not be intelligible at this point without postulating a non-spatial self as the "basal unit of psychology." Miss Calkins, while not accepting an "embodied self," was willing to concede that "this biological form of personalistic psychology provides a middle ground in which most schools of contemporary psychology may meet."¹³

The present writer has suggested that the "individual" be replaced by a *psychological* self, a "multiform dynamic unity," to use Stern's term. The native activities of this self, which text after text in *General Psychology* expound, are: (at least) sensing, remembering, imagining, perceiving, thinking, feeling, and wanting. This knowing-wanting self may be further conceived, within the psychological household, along lines of psychophysical neutrality or as psychological parallelism, or as double-aspect theory, or interactionism. But it would supply the persistent, unifying, active agent which, in its contacts with the world, adjusts its powers and develops its unique personality. On this view, the synthetic definition of Allport could be transformed to include the essential contentions of the self-psychologists thus: A self's personality is that self's dynamic organization of its own unique psychophysical wants and abilities which renders adjustments to its environment unique.¹⁴

IV. THE PROBLEM OF CHARACTER

Character, the citadel of human personality, has run afoul of the stubborn determination of recent psychologists to rid themselves of unempirical and philosophical concepts. How could this ambitious young science hope to enter the academy of the sciences with an "uncaused" will as the ground of character? A long line of moralists extending from Plato through Kant to the present have insisted that character is the product of a will free to determine action in accordance with reason. Kant went so far as to propose that the acid test of ethical action was rational willing, free even from conative inclination. This extreme intellectualism did not survive the more balanced emphasis on biological and emotional determinants of human behavior. The British especially thought of character as a part of personality; namely, the integration of drives which sustained effort in

the face of difficulties. A. Roback agrees with this McDougallian conception of character as an organization of the intellectual, affective, and conative elements which should not be confused with intelligence and temperament. But anxious to tie it up with the "cumulative meaning of the word throughout the ages," he defines character as "an enduring psychophysical disposition to inhibit instinctive impulses in accordance with a regulative principle."¹⁵ The Kantian emphasis appears in his conviction that the essence of character lies in behavior according to some absolute principle like justice.¹⁶

But neither the keen analysis of L. Klages and W. Stern nor the argument of James, when he showed that his *fiat*-will need not disturb the progress of psychology as a science, could alter the new psychological "set." McDougall expressed the basic attitude of most psychologists and some moralists when he insisted that free will (which for him meant an arbitrary power let loose within man) would discourage both ethical and scientific endeavors.

It was left to G. W. Allport, however, to deliver the *coup de grace* to character as a factor distinct from personality. Allport remarks that: "Activities involving 'will' emanate from the most complex system of personality, but not from any one area that can be arbitrarily designated as *character*," and "if will-power is shown in a man's behavior, then will-power is in his personality." "Character," he concludes, "enters the situation only when this personal effort is judged from the standpoint of some code."¹⁷

The definition of character as personality evaluated need not result in the reduction of will to an emanation from personality. For the will may still be a creative factor in the organization of the personality or character. At its clearest point subjectively, volitional choice is not the consciousness of character or personality but only of effort in the presence of alternative actions. While this datum may be explained away as an illusion of naive minds, it is interesting to note that F. Aveling, for example, after analyzing the support given the concept of irreducible will by the controlled introspection and experimental work of psychologists like Ach, Michotte, McCarthy, Messer, and Wells, and by Webb's statistical discrimination of the general factor *W* (related to *persistence* of motive), is able to conclude¹⁸ "that all the researches upon will to which reference has been

made point to an immediate experience of self-activity as constituting the experience of willing." He also finds experimental support for the conclusion that the will, rather than being the product of conative tendency, is a distinctive mental process which frequently initiates and controls striving or effort.

V. THE PROBLEM OF TEMPERAMENT

The word *temperament* is another term which, serving, especially in some British writers, as a synonym for personality, has been increasingly restricted to a basic, if not very clear, determinant of personality. In the main there is agreement among American writers that temperament embraces the innate affective-emotional tone or temper which, like an inner atmosphere, permeates the functioning of intelligence and other capacities. The four humors by which the fifth-century Hippocrates had explained the sanguine, melancholic, choleric, and phlegmatic temperaments are supplanted in E. J. Kempf's view¹⁹ by hormones. The imbalance of these hormones creates segmental cravings whose relief constitutes the function of personality. Indeed, the exponents of the "glands regulating personality"²⁰ waxed so eloquent as to draw from C. MacFie Campbell the warning:²¹

"The enthusiastic endocrinologist will translate not only the bodily traits but the whole personality of Cassius into his endocrine formula, and with his glance focussed on the pituitary gland have little interest in the organisation of all the other forces which make up that sombre personality. . . . For this worker not Wellington nor Blücher is the agent of destiny, but providence worked out its will by determining an early failure of the great man's pituitary gland."

Its biological correlates aside, how is temperament related to personality? G. W. Allport has the support of Aveling in holding that while there are temperamental "dispositions that are almost unchanged from infancy through life,"²² adaptation can take place within limits. The present outlook is expressed in Allport's definition:

"Temperament refers to the characteristic phenomena of an individual's emotional nature, including his susceptibility to

tional stimulation, his customary strength and speed of response, the quality of his prevailing mood, and all peculiarities of fluctuation and intensity in mood; these phenomena being regarded as dependent upon constitutional make-up, and therefore largely hereditary in origin."²³

VI. DESCRIPTION OF PERSONALITY AT THE TYPOLOGICAL LEVEL

A. *The Approach from Abnormal Psychology.* E. Kraepelin, striving to reduce the baffling variations of abnormal phenomena to some sort of order, drove (1899) the entering wedge which split psychoses into *manic-depressive* and *dementia praecox* (the latter to be supplanted [1924] by Bleuler's more comprehensive category, *schizophrenia*). Neurotic phenomena were dichotomized by P. Janet (1894 and 1903) into *hysteria* and *psyschaesthesia*.

What concerns us especially is that the humanistic and scientific urge to understand and prevent the incidence of these diseases led to the study of the predisposing conditions in the normal personality. This seemingly fertile problem of correlating abnormal types with normal types has produced division after division of normal personality structure and a corresponding analysis of dominant traits for each type. The interested reader will appreciate MacKinnon's informing tabular presentation and discussion of these dichotomous typologies.²⁴

The influential typology of C. G. Jung is well known. The words *introvert* and *extravert* have become part of everyday language even though their supposed relation to schizophrenia and hysteria may be far-fetched. Critics do not always realize that for Jung no person is simply introverted or extraverted, but he is introverted or extraverted in intellect, or sensation, or feeling, or intuition.

B. *The Approach from Cognitive Function.* O. Külpe, R. Scholl, E. R. and W. Jaensch built their classification around notable individual differences in perception and imagery. Scholl, building on the discoveries of Külpe that subjects in reporting on colored forms tended to notice *either* form *or* color, attempted to correlate color or form dominance with other personality traits. H. Rorschach differentiated his extratensive from intratensive types by the predominance of color over motor response respectively. The Jaensch brothers have meanwhile

built what became an unwieldy typology around dominance of spontaneous and variable eidetic imagery (B type) and the involuntary, obsessive eidetic imagery (T type). But soon came the realization that the B and T types were themselves the extremes of two more comprehensive types, the *integrate* and the *disintegrate*. In the integrate type all mental processes interpenetrate, and the imagery of this type at the extreme is eidetic. In the disintegrate type eidetic mental processes are more differentiated, but in the extreme this type lacks eidetic imagery. The integrate individual stresses feeling, is spontaneous, out-going, artistic, and plastically practical; the disintegrate emphasizes will, is the inwardly oriented, rigid, unimaginative theorist.²⁵

C. *The Constitutional Approach to Typology.* Interwoven with the problem of temperament and its relation to personality is the problem of physical type. The Hippocratic dichotomy of physical types gave way to a trichotomy in the nineteenth century when L. Rostan differentiated digestive, muscular, and respiratory-cerebral types. It is, however, to two nineteenth-century Italian anthropologists, A. di Giovanni and G. Viola, that credit must go for attempting quantitative measurements in defining constitutional differences and developing anthropometric techniques. Reports by Viola and his followers, especially Naccarati (1921), of an appreciable correlation between short body type (microsplanchny) and high intelligence have not been supported by other students. It was left to the German scholars, F. W. Bencke and E. Kretschmer, to reinforce Rostan's typology empirically, and to suggest correlations with bodily and mental diseases.

The typology of Kretschmer highlights the cycloid (related to manic-depressive insanity and pyknic constitution) and the schizoid (related to schizophrenic insanity and leptosomic and athletic constitution) types. The *cycloid* is basically good-natured and sociable, a person who swings from cheerfulness to depression. The *schizoid* is basically humorless and unsocial, a person who has warring within him at the same time shyness, oversensitive refined feeling, and insensitive, dull-witted, and sulky affectivity. It should be emphasized that these cycloid and schizoid traits are, on the one hand, transitional developments short of their clearly abnormal counterparts, and, on the other hand, *not* necessarily related to the healthy biotypes

Kretschmer designated as cyclothymes and schizothymes.²⁶

The typological description of personality has, of course, drawn the javelins of many critics. Other constitutional investigators, including those in England and America, have discovered that the complex unity of personality structure does not reward attempts to correlate segments of the physical and fragments of the mental life. The exposure of weak correlations has supported the suspicion that all typological classification is essentially arbitrary. The sacrifice of personality uniqueness and gradation to convenience was too high a price to pay, especially when the personality was forced into the investigator's special interest, be it abnormality, temperament, or constitution. "In reality, types are valid only for a limited characteristic; they embrace a segment of individuality, but never the total individual."²⁷ Furthermore, the demand for common factors among complex individuals beguiled the typologists into considering the more observable traits intrinsic to human nature and explaining less tangible trait-clusters in terms of them, *without* further investigation. They approached personality from the more accessible first story, convinced that within they could find an escalator to take them into the higher human reaches.

D. *The Approach from "Understanding" or Values.* It is from this latter angle that the *Verstehendepsychologie* of W. Dilthey, E. Spranger, and K. Jaspers is particularly interesting. These leaders in *Geisteswissenschaftliche Psychologie* begin with life as experienced, and describe *that*; they resist atomistic "explanation" as they keep their gaze fixed on part-aspects of wholes.

Agreeing with Dilthey's conviction that "the *Strukturzusammenhang* is experienced,"²⁸ Spranger goes on to describe the types of meaning discoverable in and dominating the total organization of different personalities as they interact with their cultural environments. His actual procedure is to abstract a value-tendency in one life, idealize it, and then study the particular modifications it has undergone owing to historical, geographical, and personal circumstances. Spranger believes that unless there were such "ideal directive constants" to control productive imagination and cognition, no science of personality would be possible. He accordingly delineates his six ideal types, any of which may dominate the psychic activities of a given

individual in a culture. The *theoretical* man persistently seeks systematic order in experience; the *economic* relates all experiences to problems of bodily self-preservation; the *aesthetic* man emphasizes the form and harmony in his world; the *social* regards persons as ends in themselves; the political is inclined to translate all into *power*, while the *religious* man not only seeks but embraces unity in its cosmic meaning.

While this typology raises our psychological perspective and grapples with the psychology of *quality* as well as common factors in experience, it does not escape the arbitrary segmentation of typologies, even while it refuses to break the individual down into "components." There are other values besides these which might have been used, and other members of this school have suggested other typologies. But the fatal weakness of typologies is not overcome. The incompressible variety and individuality of persons is lost.

VII. CONSTITUTIONAL PSYCHOLOGY

The problems faced by constitutional psychologies has stimulated a new constitutional approach whose essential assumption is "that human behavior is a function of bodily structure as well as of environmental forces."²⁹ Faced with the alternative: either give up the constitutional approach or give up typologies, these students gave up personality dichotomies and trichotomies. They substituted a systematic classification of bodily structures and then attempted a correlation of these with temperament. After careful analysis of many specially prepared photographs of human bodies, Sheldon was able to isolate primary constitutional components and work out a schema for grading human physiques. Physiques may be graded on a 1-7 scale for *endomorphism*, or relative predominance of digestive viscera over bone, muscle, and connective tissue, whose predominance would constitute *mesomorphism*. "*Ectomorphism* means fragility, linearity, flatness of the chest, and delicacy throughout the body."³⁰ Thus human beings are not typed but are seen to vary along dimensional axes for each of these primary components. A given physique may be characterized, say 335, about average in the first two components and more marked in the third—therefore ectomorphic.

Sheldon also believes that there is a correlation between these constitutional components

and temperament. After combing the literature and reducing the alleged traits of temperament to fifty, Sheldon, with the aid of factor analysis, discovered three "clearly defined" nuclear clusters of traits. The first, *viscerotonia*, correlated with endomorphy ($t .79$), "in its extreme manifestation is characterized by general relaxation, love of comfort, sociability, conviviality, glutony for food, for people, and for affection."³¹ *Somatotonia*, correlating ($t .82$) with mesomorphy, involves vigorous bodily assertiveness predominantly, while *cerebrotonia*, correlating ($t .83$) with ectomorphy, involves predominance of restraint and inhibition.

The identification of the three primary somatotypes, however, is merely the anchor for physical analysis.

"So many secondary variables still remain to be described that the horizon of individuality seems only to broaden and to recede to greater distance as the techniques of physical description mature to usefulness.

"Some of the important secondary variables are dysplasia (different mixtures of the primary components in differing regions of the body), gynandromorphy (physical bisexuality), texture (fineness or coarseness of tissue, aesthetic harmony of structure), secondary local dysplasias or hereditary local patternings of the primary components, often called racial characteristics, pigmentation, distribution of secondary sexual characteristics (gynandromorphic dysplasias and characteristic patterns), hirsutism and hair distribution, and so on."³²

In this psychology of constitutional differences, which replaces the rudimentary dichotomy of body and mind by the conception of a continuum, a new psychological faith is embraced. Starting "with the solid bone and flesh of the individual,"³³ it goes as far up as it can by systematically describing both physiological and psychological variables. The hope is that psychological analysis may become *total* analysis rather than simply *psychoanalysis*. The breath-taking audacity (or naïveté!) of this "total" program becomes clear in a statement like the following:

"We of the English-speaking world are repeatedly scolded because we faced a grave

responsibility in 1919, and flunked the test. Had we been able to define somatotonia, is it possible that we might have saved Germany [an 'historically somatotonic' people] from herself and ourselves from Germany?"³⁴

The main hope of the future of man becomes "discriminate breeding," once we understand how to isolate eugenically and eliminate the weak constitutional types!

VIII. PROBLEMS CONFRONTING SYSTEMATIC ACCOUNTS OF PERSONALITY

The psychology of temperaments and of types, whatever its weakness, did illuminate the persistent conviction that nature is no mere changing composite of elements passively reacting to external stimuli. Human nature, it was felt, has inner, enduring determinants which influence the course of life. Human beings, though differing from each other, have generic, innate similarities, such as physical constitution, temperament, intelligence. The basic problem confronting psychologists of personality accordingly became that of determining what the constants are, how constant they are, and how they change—a task which involves not only the study of human variables, but the effect of different environments on the individual. Underlying this whole question of change or learning is the problem of whether the introspected and observable stream of activity is goal-directed, totally or in part, or whether it is the concourse of essentially aimless, machine-like events.

Recent and contemporary approaches to personality are in fact different attempts to solve these problems (among others). In order to gain a fairly clear outline of the present situation, and at the unfortunate sacrifice of many interesting developments within each systematic outlook, we shall here be restricted to pivotal points of view.³⁵ Since much recent thinking has reacted against *hormic* theory, we may well begin our sketches with this "school."

IX. PURPOSIVE PSYCHOLOGY

A. *William McDougall*. The work of McDougall has been discussed so much from the point of view of instinct-theory that the essence of his thought has frequently been lost. His main concern is with "the organization of the affective life," which gives the lie, as he sees it,

to any analysis of human life as a mosaic of physiological or ideational "atoms" and to any intellectualistic view of motivation. McDougall needs no reminder that "personalities are infinitely various and complex," for he would insist that "each personality is in its degree an integrated unity of all its factors . . . a system of energies, each distinguishable part of which owes something of its nature to its place in the whole, and its active relations with all other parts."³⁶

1. Organization of Motives. McDougall's own reflections on personality were spurred on by G. F. Stout and A. F. Shand on the one hand, and by William James on the other. As he observed personality, he noted its stable, enduring organization around specific goals, a fact which contrasts sharply with the relatively vague orientation of emotion and feeling. Stout and Shand had observed that "interest progressively defines itself in cognition, and in defining itself transforms itself," and that "in the process of satisfying one interest new results are experienced which give rise to new interests."³⁷ It was McDougall who emphasized that such cognitive-affective dispositions, or sentiments, are not only functional units of character, but represent merely the first, child-like level of organization. Character formation in adults involves the hierarchical organization of sentiments around a dominating master-sentiment; namely, the highly complex and variable self-regarding sentiment.³⁸ McDougall is emphatic, as against Shand, that a sentiment is an *acquired* linkage of cognitive with affective dispositions.

This concept of sentiments and their organization around the self-regarding sentiment is not only fruitful in explaining many abnormal and social phenomena, but it enables McDougall to understand "those higher forms of activity which are properly called volitional, which express the integrated working of the whole personality, comprising both character and will."³⁹ For in a well-integrated character sentiments for concrete objects (e.g., money) would be regulated and dominated by sentiments for more abstract ideals (e.g., liberty). Volitional activity, therefore, depends on the way in which the sentiments are organized around the particular self-regarding sentiment. As McDougall remarks, Freudian pronouncements about the controlling function of the Ego and Super-Ego express the same contention, and it may be ob-

served that recent discussion about the organizational and directive function of ego-involvement suggest the same theoretical concept.⁴⁰

2. Tastes. In addition to sentiments the acquired personality structure includes tastes. While sentiments were introduced to describe the concentration of conative energy around specific objects, *tastes* are advanced to describe "many similar instances of acquired liking for particular modes of activity, both bodily and intellectual" (like chess or bridge).⁴¹ While tastes do not determine our goals, which spring from innate propensities and sentiments, they do "very largely determine our choice of means or modes of activity through which we shall pursue our aims and work toward our goals."⁴² While McDougall raises the "difficult question" as to whether tastes become independent sources of energy⁴³ and seems hesitant about making an exception to his underlying hormic principle, he finally suggests that tastes are not only acquired in the service of some sentiment or propensity but remain inactive and subside once conative support is withdrawn.

3. Propensities. This, in essence, once the innate factor of *temper* is added, is McDougall's view of personality organization as built from clues gleaned especially from Stout. But Stout left him unsatisfied when he asked the questions: If sentiments are highly organized dispositions, how are such dispositions formed? What are their components? He therefore felt driven, developing a suggestion provided by James' instinct-theory, to *postulate* his much-discussed list of instincts, which needs no repetition here. A central contention in his own view, despite the mis-reading of many critics, is that instincts (or propensities) do not involve rigidly prescribed trains of means-to-end movements, but are capable of varied adaptation in accordance with the special circumstances surrounding the attainment of the instinctive goal. McDougall's view that each instinct is accompanied by a primary emotion has been questioned even by adherents. Nevertheless, as C. Burt wrote in a recent Symposium,⁴⁴ subsidiary assumptions aside, it is not easy to gainsay McDougall's contention that there are complex inherited "cores" of impulse, or tendencies, which drive each member of a species, other things being equal, to perceive and pay attention to certain objects or situations. As we shall now see, this hormic thesis finds significant

acceptance and alteration in the thought of H. Murray.

B. Henry A. Murray, Jr. The problem-sensitive, architectonic system presented in *Explorations in Personality*, 1938, is an extremely careful attempt to embrace conflicting tendencies in "personology." While Murray's clinical methodology and outlook are strongly influenced by Freudian conceptions of personality, his theorizing is in fact a critical synthesis of McDougallian hormism and Lewinian configurationism.

1. Double-aspect Theory. At the outset Murray adopts that version of the double-aspect theory which states that "every conscious process is the subjective aspect of some regnant brain process, but not every brain process has a conscious correlate."⁴⁵ This theory not only justifies introspective description, but it also makes room for unconscious processes in personality. The personality for Murray is the dominant unity of brain processes, which interact, of course, with the bodily chemistry. This personal unity, while not what we have called the psychological self, is "time-binding," capable of conserving past, anticipating future, and therefore of continuity of purpose.⁴⁶

2. The Necessity for a Non-Mechanical Concept. Murray is impressed by the fact that an individual may achieve the same adaptation to environment despite the differences in the behavioral means used to produce that effect. As a matter of fact different means seem to be retained only as long as they aid in adaptation. In order to explain the relations of a given set of observable means-actions to each other and to the total effect (e.g., "the resumption of unpleasant work after interruption and the increase of striving in the face of opposition"),⁴⁷ Murray is forced to postulate an "invisible link," namely, a brain process, a persistent trend, need, or drive toward certain general goals. This hypothesis is further supported by the introspection of desires or tensions which, on the double-aspect theory, would be expected to have electrochemical counterparts. Thus Murray recognizes the fact which is central to "situational psychology," that there are stimulus-response sequences activated by tensions which they serve to reduce. But in opposition to behaviorism he interprets the data purposively, as "the lawful connection between a certain kind of stimulus and a certain kind of trend."⁴⁸

It must be immediately added, however, that

for Murray, while purpose is consciously felt as a "pull from the future," it is in fact a push from the rear, that is, "a strictly present" brain process that points and co-ordinates activity.⁴⁹ On the other hand, the need is not to be equated with visceral tensions or endocrine secretions; these are the sources of, but not, the need-processes. If this "working hypothesis" does not satisfy those "psychologists who bristle when 'purpose' is mentioned," they are reminded of Whitehead's rejoinder: "Scientists animated by the purpose of proving that they are purposeless constitute an interesting subject for study."⁵⁰ Still, though Murray is not a mechanist, it is clear that he is more of a "dynamist" than a purposivist of the McDougallian sort. His version of double-aspect theory, in which consciousness need not reflect the bodily process, helps, perhaps, to account for his unwillingness to allow consciousness of a non-existent future to affect present action. Here is another instance of difference on fundamental problems affecting psychological interpretation.

3. The Nature and Organization of Needs. Neither emotion, as with McDougall, nor reflexes, as with behaviorists, constitutes the essence of need. Emotion and action patterns are helpful indices of needs but a need always is an organic disturbance which directs means to the end of re-establishing equilibrium. Murray is insistent that every attempt to substitute the mechanical action of the neuro-motor system for dynamic needs introduces adaptive trends "surprisingly."⁵¹

A persistent difficulty for any need-psychology is that of distinguishing innate from learned needs. McDougall was forthright in defending the innateness of certain social and psychical propensities (like gregariousness and curiosity) as well as organic needs. Murray, however, seems more convinced of the innateness of his thirteen "viscerogenic" needs than of the twenty-eight "psychogenic." The psychogenic, "though found to operate without dependence upon the viscerogenic needs were perhaps once subsidiary to the latter."⁵² Furthermore, though psychogenic needs (of which Construction, Dependence, Dominance, Aggression, Abasement, Succorance and Cognizance are examples) are common reaction systems manifested in all peoples, and though some of them may be innate, they are greatly influenced by cultural forms. The problem of innateness is not a central concern

to this acute observer. He pays more attention to distinguishing need-tendencies from each other and noting their directive effect on action patterns, and, in turn, the restrictive effect of action patterns on needs.

Even more important for the understanding of personality development, however, is the realization that needs become concentrated through learning on abstract or concrete objects, as well as on the self. Thus, baptized with the Freudian terms of positive and negative cathexes, McDougall's sentiments reappear. Here too, however, Murray would insist that while the personality is revealed in the objects it cathects, "especially if the intensity, endurance, and rigidity of each cathection is noted" in the individual's social situation,⁵³ it is more important scientifically to know what needs are being expressed.

At this point, Murray introduces a new motivational concept to which McDougall seemed blind—something besides needs attaching themselves to objects and objects evoking needs. He is impressed by the "consistencies of connections" between objects, needs, and certain characteristic modes of action. Without this particular consistency of connection there would be no stable personality. Under the name of *need integrate*, Murray, therefore, conceptualizes a "relatively stable organization in the brain 'wherein' traces (images) of cathected objects in familiar settings become integrated in the mind with the needs and emotions which they customarily excite, as well as with the images of preferred modes."⁵⁴

A complete account of Murray's motivational concepts would articulate *subjectified* and *semi-objectified* needs as well as *attitudes*. It is more important here to note that this whole conception of need-functioning forces a radical change in the view of environmental stimuli. As Lewin had already suggested in his concept of "valence," the environment can no longer be simply the source of stimuli. It is to be understood as that aspect of the total field which is alive with threats or benefits to the individual. Rather than understanding the individual in terms of his environment, Murray sees the environment in relation to the "press," the relevance or irrelevance it has to the well-being of the person. Both "personality" and "environment" thus become the by-products of the individual's struggle to regain or establish need satisfaction.

Murray's view thus contrasts sharply with that of the school we are about to study, according to which the personality is essentially a product of the environment.

X. THE BEHAVIORISTIC AND ASSOCIATIONAL APPROACH TO PERSONALITY

Convinced that psychology can never take its place among the more exact physical sciences unless experiments are objectively controlled, quantitative analyses made, and results predicted, members of the behaviorist or objective school of psychology have found it necessary to belittle, deny, or disregard the validity of introspective observation and to sterilize psychology of all final causes.

A. OBJECTIVE ASSOCIATIONISM: LAURANCE F. SHAFFER

1. Derivation of Motives. On this influential approach the sources of human activity are not instincts—conceived as universality of certain types of behavior and thus all too vulnerable—but inner physiological tensions and emotional excitements. The only innate drives are hunger, organic or tissue needs, sex, fear, anger and (after E. B. Holt) primary adience. The "organism," attempting to reduce the tension set up by these drives, develops *habits* of removing the incitatory stimuli, or *motives*. These habit motives, such as mastery, submission, and sympathy, which McDougall considered innate, are not independent and autonomous springs of action, but function "only through the operation of the 'lower' fundamental drives of physiological and emotional tensions."⁵⁵

2. The Adjustment Process. The adjustment process begins when a drive is thwarted and ends when, as a result of trial and error or varied actions, a response is found which reduces the drives and thereby solves the problem. Is the response selected because it is pleasant? Shaffer rejects this Thorndikean thesis that "pleasure *per se* strengthens the neural connection and that pain weakens it," for such a notion is "entirely hypothetical," redundant, and empirically absurd, since pain is frequently an aid to learning.⁵⁶ Such mentalistic principles as pleasure and pain, or the "insight" of the Gestalt school, may be regarded as supplementary "*gross descriptions*" of adjustive learning, but how either can explain improvement is not clear.⁵⁷ Simultaneous conditioning, however,

can explain the selection of responses. Specifically, those responses are repeated "*that lead to tension reduction and the completion of motivated activity.*"⁵⁸ The cat in the puzzle-box does not learn to move the latch merely because of pleasure resulting, but because simultaneously with the exploratory adient movement toward the food the latch was released with consequent drive reduction.

3. Adjustment and Personality. The implications of this view for personality becomes clear when we realize that: "The personality traits of the individual are his persistent habits toward making certain kinds of adjustment rather than other kinds."⁵⁹ Again, traits are "residuals of the individual's . . . past tension-reducing solution of problems."⁶⁰ While Shaffer speaks of a "unified and continuous process of the growth of personality,"⁶¹ there is no theoretic attempt to explain why, in a receptacle of protoplasmic irritability, a "balanced outlook" should ever be effected. Shaffer does remark, incidentally, that integration may be a function of discriminative ability⁶² with resultant loss of inhibitory actions.

Thus it is, we are told, that "much unnecessary mystery to the development of personality characteristics"⁶³ is removed. One can see why Murray and McDougall were not satisfied by such resolution of mysteries. Far from being explained, the mysteries of purposiveness seem to be swallowed up or transliterated into scientific-sounding words like *tension* and *drive-reduction*, terms that have no concrete meaning unless purpose is insinuated.

B. SITUATIONAL ASSOCIATIONISM: EDWIN R. GUTHRIE

1. Trait Development. Guthrie, convinced that "in the strict sense all human behavior consists in muscular contraction and glandular secretion," believes that human personality "must in one sense be reducible to such activities of effectors."⁶⁴ We need not "speculate concerning the deeper reaches of the soul,"⁶⁵ or consider the personality as any kind of entity. For personality traits, like neatness and honesty, are the products of simple movements which have been combined into grosser acts in given situations. But no thoroughgoing understanding of a man can be achieved by describing his traits or acts, for "in any particular man the achievement of an act is completely dependent

on his acquisition, through learning, of a specific and stereotyped movement or set of movements for the accomplishment of the effect that defines the act."⁶⁶

2. The Associative Process. What fixes the correct response for Shaffer? The adjustment-process conforms strictly to associative learning. The individual, responding to a threatening situation, struggles until the movements appropriate to remove the threat appear. This set of threat-removing movements in that situation are protected from unlearning because in removing the individual from the threatening situation, they prevent new associations. Thus the appropriate movements are retained and the inappropriate eliminated. Once a habit is formed it becomes more characteristic of the individual than of the situation. Other similar situations evoke it and soon the individual becomes predictable in terms of his unique stereotyped habits.

Guthrie realizes that re-exposure to identical situations is impossible, and he is forced, with the rest of us, to predict in terms of "tendencies" rather than responses. It is not clear, however, how these mechanically associated responses, stereotyped to one stimulus-situation, can become tendencies in stimulus situations admittedly different. Assume that a tight collar led a man in a maiden speech to tug at it while talking, and that this mannerism has remained for years even though his collars have been larger. Is it true, as Guthrie says, that the movement elicited and guided by the pressure of the collar "now guides itself and can be started by odd components of the situation 'beginning a speech'?"⁶⁷ The similarity between "tight collar" and "beginning speech" calls for a meaning-analysis not forthcoming from such situational associationism.

Nevertheless, for Guthrie a repertoire of movement habits is hierarchized into act habits by selection and inhibition adjusted to a goal under the systematizing effects of institutions and culture. Personality is constituted by "those habits and habit systems of social importance that are stable and resistant to change."⁶⁸ Since general traits are not only harder to measure and "almost impossible to use after they have been measured,"⁶⁹ it is far better to restrict ourselves, in understanding personality, to analyzing the ways in which a neat person is neat in his situation, and especially to the skills he

has acquired in specific vocational and social adjustments.

3. Dynamic Associationism, A Synthesis? Determined that no soul-like, "theological" entity and no "mysterious" purposes should re-appear on the psychological stage, these objectivists have enthroned the ambiguous principle of association. The views recently expounded by Mowrer and Kluckhohn⁷⁰ are all the more interesting if regarded as a counter-movement within association theory. They attempt a synthesis of unfavored psycho-analysis with learning theory, after the manner of Shaffer, but with Shaffer's implicit purposivism become more explicit. These writers insist that the moment the "advantage" of an adjustment is mentioned, associationism must become purposive. For them a man's behavior is the product not only of the total context in which it occurs but of primary tissue needs and secondary emotional tensions such as fear, anger, and love. These drives press for maximal integration or equilibrium; relatively stable, predictable habits result from the fixation of conflict-reducing movements. Personality is formed as these habits merge into an "organized, adjusting, behaving entity."⁷¹

XI. THE APPROACH FROM STATISTICAL EMPIRICISM OR FACTOR ANALYSIS

A. *The Task*. Another attempt to deliver psychology from the sands of introspection and set it upon the rock of objective quantitative measurement is that known as Factor Analysis. Objective psychology, aided by mathematics, brought with it performance tests. Further aid from statistical procedures made it possible to intercorrelate many tests taken by the same subject and thus clarify both the problem of the individual differences and the structure of personality. For, as Charles Spearman, the leader of this movement, saw it about twenty years ago, the assumption that mental functions like memory are unitary is unsupported. Does the memorizing of details involve the same "memory" as the remembering of principles? Is the cheerful person cheerful in all situations? The answer should depend on objective and adequate scientific justification.

No account can be given here of the different correlation techniques and factorial methods used by Spearman, G. H. Thomson, K. J. Holzinger, C. Burt, W. Stephenson, L. L. Thur-

stone, R. Cattell and many others. Common to all factor analysis, however, is the assumption

"that performance in any field such as the cognitive, depends neither upon one undifferentiated ability nor upon a completely chaotic conglomeration of separate abilities. Rather it is assumed that cognitive ability consists of a number of different factors, traits, faculties, or powers, each of which is elicited by a variety of different tests or problems."⁷²

In essence, then, the factor analyst studies the intercorrelations between the tests taken by his subjects, and notes the common factor discernible in the performances on various tests. "All that is assumed is that a cause or group of causes, however produced, acts as a functional or operational unit."⁷³ Strictly speaking, therefore, a factor is a mathematical abstract indicating the presence of some common determinant among the variables studied. Factor analysis is a simpler level of analytic description than the tests; at a deeper level are the many genetic and experimental constituents of the factors.⁷⁴

It should be clear that the factor analyst as such has no new source of information on the *psychological* nature of the factor. He may hope, as Thurstone does, that one day the factors will be identified "in terms of different aspects of the physical system that constitutes a person,"⁷⁵ but all such preconceptions or interpretations of statistical results will not enjoy a mathematical, objective basis, but will depend on the psychological acumen of the analyst. It is the conviction of Spearman, reaffirmed by Wolfle after his excellent survey in 1940, that truth will be approached only if the imaginative and the clinical accounts of factors supplement each other.

B. *Early Discoveries*. Historically speaking, factor analysis was so productive in dealing with cognitive traits that the technique was applied to motor and mechanical abilities and then, more recently, to the problem of basic personality traits.⁷⁶

Spearman's experience with the Theory of Two Factors will illustrate the basic procedure. He noted upon analysis of scores of dissimilar mental tests, a *general* factor *G* common to all, and another *specific* factor *S* varying with each test. While *S* varied irregularly with the *S*'s of others, *G* kept the same proportionate relation. The more *G* was found in any ability, the less

S, the latter seeming more dependent on organic powers, past experiences, non-cognitive aptitude for the given task, and sheer retentiveness. This hypothesis, drawn from limited observations, was subjected to an extensive investigation at Chicago. Ninety-four tests were administered for abilities ranging from creative imagination, perception, memory, and attention to speed of tapping. The analysis of these tests revealed the general factor *G* in every cognitive ability, save retentivity, though in different degrees (e.g., 5 per cent in tapping, 65 per cent in generalization).

So much for mathematical analysis. The next problem, which "leaves room for widely divergent views,"⁷⁷ is: What is the nature of *G*? Lashley, the physiologist, suggested that *G* measures some "mass action" of the cortex, and Thorndike changed his earlier atomistic view of mind when he suggested that *G* was "some unified, coherent fact in nature" independent of non-intellectual factors.⁷⁸ Spearman himself tends to think of it as measuring "general energy" supplied by a large portion of the nervous system.

C. Factors of Personality. It was B. J. Webb who extended factor analysis significantly to non-cognitive ("orectic") traits. His study of character not only confirmed *G*, but analysis of evaluations of personal and social moral traits yielded *W*. "Its nature is best conceived . . . to depend upon the consistency of action resulting from deliberate volition, i.e., from will."⁷⁹ But once more, "the interpretation is extremely open to controversy and to progressive improvement."⁸⁰ It is worthy of note at this point that the studies made by Hartshorne, May, and Maller on the generality of character-traits such as honesty and persistence (characteristics of *W*), when subjected to factorial techniques by Maller, indicated the presence of the general factor *W*, a conclusion in direct opposition to the earlier non-factorial analysis of the data.

The application of factor analysis to other aspects of personality has indicated over fifty factors. Major agreement, as Wolfe's 1942 study reveals, is found in *C* or cleverness, *S* or sharpness, *F* or fluency of mental activity, *D* or mental depression, as well as factors such as self-confidence and hypersensitivity respectively.⁸¹ Thurstone, attempting to interrelate personality with perceptual experience, suggests "a factor

that is conceived with facility in perceptual closure which is distinct from considerations of acuity," and several others.⁸²

D. Appraisal. There can be no reasonable objection to organizing the results of human performance more economically and suggestively. It is only when considerations of mathematical convenience and parsimony dogmatically guide interpretations about the psychological nature of the unit involved, or lead to the substitution of factorial *analytica* for psychological description that protest must be vigorous. For mathematical procedure must be guided by psychological conceptualization of the traits involved, and in the end, if factors are to have psychological meaning, they must be interpreted in terms of psychological functions and what is otherwise known about personality. As Thurstone said,⁸³ factors may give a crude first map of a new area, but the concrete highways will have to be laid out with our best psychological insights. After all, not the skeletal bones of abstracted factors but the unique organization of a personality which embraces them is our concern!⁸⁴ Indeed, careful analysts like Burt and Spearman not only bemoan "statistical zealots" who accumulate "masses of figures that remain psychologically senseless," but remind us that "the very development of statistics is showing with increasing force where their own brief authority must come to an end."⁸⁵

XII. THE GESTALT AND HOLISTIC APPROACH: KOFFKA, LEWIN, AND ANGYAL

A. Implications of Holism. Standing solidly on empirical studies of perception, learning, and thinking, Gestaltists have carried their battle against the mechanical associationism and behaviorism into the field of personality. Andras Angyal,⁸⁶ expounding clearly the logic of this approach, has recently insisted that organism and environment are not two independent ultimates which interact. They are, rather, two distinguishable tensive poles within a reality-field. But while hostile to atomistic "mechanistic" explanations, Gestalt theorists shy away from positive teleology. Indeed, it may be said that they have substituted for an atomistic mechanism a non-purposive, mechanistic whole whose intrinsic order determines the needs, nature and function of the parts.⁸⁷ Thus trends, tensions, needs, and directional tendencies relieve the

mysteries supposedly implicit in propensities. For example, Angyal attributes to the organism an inherent "self-expansive tendency,"⁸⁸ or an "undifferentiated trend toward increase of autonomy." But he discards the word "teleological" for "directional" to describe this view, since he fears that teleological activity involves reaching a goal,—though he admits that "the much criticized 'purposivists' almost never have used such a rigid and static concept of teleology."⁸⁹ At any rate teleology as well as mechanism is rejected.

The Gestaltists join purposivists, nevertheless, in rejecting stimulus-response psychology. But they add their own touch. An individual responds not to an environment, but to the environment *as conceived by him*. Thus Gestaltists distinguish the behavioral or psychological environment from the inferred or geographical environment. Thus, as Angyal says: "The concept 'external world' must be clearly distinguished from the concept 'environment.' The external world can be called environment only when and in so far as it is in interaction with the organism."⁹⁰

The Gestalt master-key is used to unlock the mind-body mystery also. K. Koffka and K. Lewin accept the isomorphism developed by Wertheimer and Köhler. On this view "any actual consciousness is in every case not only blindly coupled to its corresponding psychophysical processes, but is akin to it in essential structural properties."⁹¹ Not even this doctrine is holistic enough for Angyal who is convinced that both mental and physiological events are functions of a psychophysically neutral or holistic unit (Stern). "Neural processes cannot produce ideas, and thoughts cannot make muscles contract, but the total organism, the person, can do both."⁹²

B. Holistic Personality Formation. Restricting ourselves to relevant contributions of Kurt Koffka and Kurt Lewin, we shall note how the concept of personality emerges from this ground of holism, behavioral environment, and isomorphism.

An Aristotelian would view a personality as an individual exemplification of a class, but not Lewin! He sees personality developing from the present convergence of field forces. Unlike Murray who emphasizes the past, or Allport who focuses on unique and orderly patterns within personality, Lewin keeps his eye on the present

dynamic balancing of personality-environment forces. As Koffka says, the personality, or Ego, "is neither a point, nor a sum or mosaic of drives or instincts."⁹³ It is the development of the organism, a "peculiar kind of system" which maintains its own orderly equilibrium and spatio-temporal unity as it evolves and interacts with the world.

Indeed, were there no Ego and "its attention and attitudes," there would be no behavioral world and no "external" world. The Ego is the nucleus of spatial dimensions. Furthermore, it can expand to include one's clothes or shrink to exclude one's body, or thoughts, or emotions. The boundaries of this elastic Ego are not predetermined but variable. This variability does not mean, however, that all processes or things are equally fit for incorporation within a specific Ego.

However, if the Ego does have a variable "membrane," what are "the forces that at this moment keep the Ego segregated"?⁹⁴ Koffka candidly admits ignorance on this question and goes on to explain why some processes are incorporated into the Ego and some not. Were it not for the spatio-temporal coincidence of visual and kinaesthetic impressions the infant could not weld his bodily Ego together in the second year. Then the needs which well up and persist within this Ego-system become foci of organization. While the Ego is formed on the conscious level, the more stable developments probably persist below the conscious level as what the Freudians call the "unconscious." It is this "stable organization of the Ego-system which prevents it from being changed by every new influx." Still, while thus anchoring and "directing" growth the Ego itself is always going somewhere and its stability "must, therefore, always be seen in relation to the direction in which it is moving."⁹⁵

This Ego clearly squints! It is both the incorporator and incorporated, both knower and known, wantor and wanted! This squint pursues Koffka and Lewin every step of their way. Their concern for a concrete account of personal unity in terms of field theory seems to blind them to the theoretical presupposition of belongingness—an indivisible active agent—which incorporates the Ego in the first place. Aristotle may have lost the individual to the class; Koffka and Lewin lose him to the field. Would not the intrinsic unity of a purposive, knowing-wanting

self, which develops an Ego, provide the force which keeps the Ego segregated?

C. *Internal Personality Structure.* To the genetic, longitudinal account of Ego-formation must be added a cross-sectional account. The fact that the incorporating boundaries of the Ego are variable indicates that the Ego is a network of sub-systems whose inner tensions activate it. Thus, in order to explain the conclusion of Zeigarnik's famous experiments, in which the subjects remembered incompleted tasks better than the completed, we must suppose that the tensions set up by each task belong in relatively independent, insulated sub-systems. The systems for completed tasks are more stable, their tensions having been released. But the duration of unfulfilled tensions become particularly strong "if the tasks of the experiment were in communication with the Self."⁹⁹

We realize, accordingly, that, for Lewin, within the structure of the *developed* Ego (not the developer of the Ego), a "permanent sub-system" has been incorporated which represents the "real needs" and ambitions of the individual. "The Ego has a core, the Self, and enveloping this core, in various communications with it and each other, are other sub-systems comparable to different layers, until we come to the surface, which is most easily touched, and most easily discharged."⁹⁷

The sketch thus presented does not begin to do justice either to Koffka's intricate discussion or to Lewin's symbolic, topological mappings of the personality into an inner-personal region with its central and peripheral strata and motor regions. It must suffice to emphasize that "each dynamized, psychical system does not have clear communication with every other,"⁹⁸ though frequently the satiation of a need in one system produces satiation in a functionally adjacent one. The action that ensues always depends on the intimacy of intercommunication at a given time in a specific total situation.

XIII. THE PERSONALISTIC APPROACH:

STERN AND ALLPORT

It should be clear now that the psychology of personality has been very sensitive to the assumptions, methodological techniques, and the new discoveries in the physical and social sciences. The human personality has been stretched and shrunk, measured and classified,

injected with "forces" and reduced to nerves, muscles, and glands, all in the name of science, which after all is itself a production of human personalities. It has seemed more important to be true to science than to personality. Time and again the approach and answer to problems have depended on whether the psychologist was more concerned to keep the totality of human experience before him and test his insights by the best scientific procedures, or whether he allowed the norms, procedures, and assumptions of science to determine his approach to personality. Adequacy to all the psychological data and adequacy to "science" are in constant conflict. Thus a scholar like C. L. Hull,⁹⁹ in order to guard himself against what he regards as the fatal, anthropomorphic, teleological explanation to which many psychologists unfortunately succumb, goes through a purifying ritual of regarding "from time to time, the behaving organism as a completely self-maintaining robot, constructed of materials as unlike ourselves as may be." Such is the price personality is sometimes called upon to pay as its corpse is glorified with the swastika of scientific objectivity.

A. William Stern

1. *The Person as Convergent.* Stern's personalistic psychology is a protest against this "scientification" of psychology, and the resulting "mechanization of spiritual life."¹⁰⁰ For Stern, "man *qua* person is a unity, indeed the primordial and most pervasive unity in the range of the experiential world . . ."¹⁰¹ He resists, therefore, every attempt to dissect, or type, or reduce "genuine individuality," as distortions of that "something indivisibly singular, a personality."¹⁰² The person is a "unique and self-sufficient *unitas multiplex*, whose activity as a purposive function is directed toward self-preservation and self-development."¹⁰³

Stern expounds his doctrine of a psychophysically neutral person as a "radical synthesis" not only of the mind-body problem, but also of the exclusive dualisms of consciousness-unconsciousness, of teleology-mechanism, and heredity-environment. Thus, consciousness occurs only when the smooth, vital flow of psychologically neutral ongoing is interrupted. The person, "the most genuine whole of all" is always a mixture of constraint and feeling . . . *Gestalt and Un-*

gestalt,"¹⁰⁴ and not a homogeneous Gestalt. Indeed, "*Keine Gestalt, ohne Gestalter*"!¹⁰⁵

Furthermore, personal development is not a mechanical interchange between the person and the environment. The person's "purposively inclined but not yet unequivocally confirmed tendencies" are given greater definiteness within the environmental situation. But the environment acts not as a coercive field "under whose pressure the person is cast into a certain mold." Its stimuli, rather, are "raw materials, points of attack, and collaborations" of the inner purpose.¹⁰⁶ In fact, "the interaction, the 'convergence' of these two groups of conditioning factors is the occurrence of the real person."¹⁰⁷ Stern thus saves the unity and resiliency of personal activity without denying the effect of the environment.

2. Motivation, Will and Character. Indeed, personal development involves a "constant, never-ending task of realizing values"¹⁰⁸ which the environment suggests (introjection). This process in fact actualizes inner strivings. For Stern, the "goal-structure" of the person embraces not only implicitly purposive reflexes, but innate, vague, directional dispositions. He recognizes three types of vital urges,—those for self-preservation, those of self-development, and elementary social drives which man shares with animals. Unlike many contemporaries he boldly insists that in man there are drives "toward intellectual, ideal, and cultural objectives." These cognitive and creative drives, to be sure, presuppose personal maturity, but they must not be overlooked simply because they do not occur "in the form of bare impulsiveness."¹⁰⁹

Stern would have little sympathy with the customary bony, parsimonious lists of tissue and social needs. For he cannot bridge, as the other psychologists do, the gaping chasm between these wants and the artistic, scientific, and religio-ethical needs by uttering the magic words "conditioning in a society." For Stern the "higher" are not only not derivable from the "lower." The supposed development from the lower could not be effected without the co-presence of the "higher"! Nevertheless, Stern also sees that all of these vague, flexible directional tendencies become more articulate when they meet resistance and become needs for future fulfillment, or the fighting core of personality.

Finally, while most psychologists, including McDougall, would stop here and consider human will the product of character formation, Stern's concern to "save the phenomena" leads him to make a careful analysis of will.

At the simplest level we experience will when we sustain an obstructed desire, say, to pick up a book. But the experience of will is more articulate when we choose between wants and general principles, and more "intellectual" when we prosecute a well-laid plan. Unable to reduce will to conation, Stern contends that it is interwoven with, and supports, conative life! When needs whose goals are too remote cannot be satisfied directly, will acts to close the gap between striving person and denied result. In willing the person "has a peculiar consciousness of self-activity."

"The acme, however, comes in the concentration, at a definite instant, of the experience of being able to act, into a direct experience of acting 'Now I will . . .'. This onset, which eludes closer inspection, is the core of every act of will."¹¹⁰

And so intrinsic to personal activity is this Jamesian fiat that Stern exclaims, "*Volo, ergo sum*."¹¹¹ It should be superfluous to add that intellect, emotion, and will are phases of indivisible personal activity.

Character, on this view, becomes the person's "own monumental achievement"¹¹² gradually selected and developed in "convergence" with the value-environment. It is at once the product of willed learning, and the matrix in which many "settings of will," lasting and temporary, take root. What other psychologists call attitudes or traits become for Stern "readiness for acts of will of a definite kind and direction."¹¹³ And Stern, with McDougall, anticipates recent Ego psychology by pointing out that the hierarchical structure of character is in the last analysis "produced by the incorporation of self-regarding goals and outside goals."¹¹⁴ At this point Stern acclaims the "important progress toward this goal . . . in G. Allport's *Personality*."

B. Gordon W. Allport

1. Emphasis on Uniqueness. The personalistic viewpoint advocated by Stern has found learned,

empirical, and original support in G. W. Allport's writings, especially in his treatise: *Personality: A Psychological Interpretation*, 1937. Psychophysical parallelism is substituted for Stern's psychophysical neutrality, but the "undivided personality," with its uniqueness, its basic continuity, its unity and multiplicity are never forgotten by this scholar. Impressed by the insistence of Dilthey, Klages, Jaspers, Spranger, and Stern, that individuality be taken as the psychological datum, he proposes that every hypothesis, *Verstehende* or not, be submitted to every conceivable empirical test and procedure, "case-histories and diaries, ratings, biographies, correspondence, introspection, questionnaires, clinical records, psychoanalysis, clues from expressive behavior, or drama and fiction,"¹¹⁵ as well as experiment and intuition.

Far from yielding to the arbitrary conviction of "high science" that the individual must be considered as an example of generalized categories, Allport bends every energy to reveal and explain the lawful patterning within individual life. A psychology of the concrete interrelated personality structure cannot, as Klages once said, be built "out of the permutations and combinations of the universal characteristics."¹¹⁶

2. Purpose and Motivational *Given*. While Allport, like Murray, Koffka, and Angyal, would immediately reject thoroughgoing mechanism, he would seem to agree with Kempf (and Shaffer and Guthrie) that in early childhood there is "no need to postulate an elaborate system of latent purposes,"¹¹⁷ and that behavior is stimulated by innate, vegetative "pushes." As a matter of fact, however, he would object to any "sharp antagonism" between "pushes" in infancy and "pulls" in maturity. For he believes that the "organismic position" has succeeded in overcoming the teleology-mechanism antithesis by redefining both purpose and mechanism and "reconciling them within the new concepts of structure and system."¹¹⁸

For Allport, then, the child, uniquely *given* a physique, temperament, and general intellectual capacity is motivated to reduce segmental tensions such as hunger, strain and other physical needs. Unlike Shaffer and Kempf, however, Allport sees that:

"It is all too easy to say that the primitive organic tensions become *conditioned*, and by this bit of verbal magic to think that one has

accounted for all the motives of the adult personality whose desires include not only nutritional and sexual satisfaction but likewise fine music, rare books, and the answers to puzzling problems in science, politics, and theology."¹¹⁹

But where Stern had supplied roots for such non-organic tendencies (especially in the drive for intellectual activity), Allport cannot accept any generic list of propensities, rich or poverty-stricken, and this for two main reasons.

First, similarities in basic motivation alleged by hormic theories can be explained by the fact that "similarly constructed individuals living in similar environment, influenced by similar culture, *would* develop similar goals and employ similar methods of obtaining them."¹²⁰ Bertocci wondered how a similar culture could exist in the first place unless human beings are also given similar non-physical drives in a similar physical environment.¹²¹ Allport replied "that the universal features in cultural practices all over the earth appear to be too few in number to argue from them to common instinctive causation."¹²²

Second, he believes that "an elaborate process of learning and growth intervenes between the organic wants of infancy and the cultural wants of adulthood, involving all manner of linguistic, imaginal, and rational factors that ultimately transform the segmental cravings of infancy and innate propensities into desires having no longer any functional connection with them, but holding in their own right an autonomous place in personal life."¹²³

The process here referred to is that of *functional autonomy*, but the issue intrinsic to it is that of ontogenetic emergence. Can pre-social vegetative drives be transformed into social, aesthetic, and spiritual desires? Allport, agreeing that the psychology of learning has not adequately considered this particular problem, is forced to lean on the principle of ontogenetic emergence to support his conviction that early propensities (given such) are not merely altered, as McDougall, Murray, Shaffer, and Stern would hold, but "*supplanted*" by adult motives.¹²⁴ The problem at this point enters the realm of metaphysics, where we must leave it, but not without the realization that explanation of personal continuity is at stake.

3. Personality Development. The adjustive responses of the plastic infant take on selective

consistency by six months. When conditioned reflexes are integrated into habit-systems and these habit-systems are embraced by traits, personality begins to take shape. The growth of self-consciousness is fundamental to the development of personality for in it is reflected the individual's concept of his world, his introception of social norms, or his *self-esteem*. Maturity brings with it an ego-ideal, "the plan that the developed personality is able to evolve for defeating, by transcending, both the unsocialized urges of the Id and the dullness of the Super-Ego, leading thereby to a new level of personal freedom and to maturity."¹²⁵ Allport hammers the thesis that a person's behavior is the product of his *present* organization; he is anxious to avoid excessive reliance on the environmental situation (Lewin) or on the past experience, especially when interpreted psychoanalytically (Murray).¹²⁶

4. *Inner Personality Structure and Traits.* Allport, we have seen, rejects any suggestion that the unique personality is a variation played on central, general themes. Adulthood sees "greater and greater divergences from the relatively standard pattern of infancy,"¹²⁷ thanks to functional autonomy. However, to account for relatively stable but unique personality, a concept must be developed which accounts for the continuity, uniqueness, and variability of personality. The definition of a trait suits these requirements. A trait is "a generalized and focalized neuro-psyche system (peculiar to the individual) with the capacity to render many stimuli functionally equivalent, and to initiate and guide consistent (equivalent) forms of adaptive and expressive behavior."¹²⁸

This conception of a generalized trait has had to battle with an opposing view which dominated the American scene. According to this prevalent, earlier view, traits (honesty, neatness, self-control) are unempirical speculations, especially since certain experimental findings force the conclusion that specific habits alone are the units of personality. Furthermore, we cannot predict what an individual can do in a given situation, unless we know how his past experience has linked his movements to that stimulating situation; to predict his behavior in other situations is always a hazardous undertaking, since a person is not neat as a man but neat in that situation and in this insulated way. "It seems to be a fair conclusion from our data

that honesty and deceptive tendencies represent not general traits, not action guided by general ideals, but specific habits learned in relation to specific situations which have made the one or the other mode of response successful."¹²⁹

Allport is not slow to underscore the quandary we would be in if this doctrine were taken seriously in practice. Do we not expect a man to be trustworthy in situations unlike the one in which the "habit" was built? The common sense in the theory of general traits is supported by experimental findings. For example, to suggest that inconsistency in the honesty of children is an argument for specificity is to overlook the fact that children have *other* traits, such as bravado or timidity, which keeps them from consistent practice of honesty as a trait. Indeed, personal consistency in conduct will never be adequately discovered by statistical methods which compare individuals only for a common trait.

In any case, this theory, which would explain consistency of conduct by partial identity either in the environmental situation or between the habits themselves, stands up only as long as the exact nature of the supposed common elements goes unprobed. Careful problem-suited experiments indicate over and over again that "identical elements in themselves have no power to effect transfer. Only when a general principle is *understood as applicable* to two or more fields does training carry over to the others."¹³⁰ Nay, identity and similarity are not objective factors stimulating an individual, for he must see identities and similarities as being functionally equivalent to *him*. Thus, to a loyal American, buying bonds, giving blood, reducing house temperature, writing V-letters, and sending his son off to war are functional equivalents because of his trait of patriotism.

Traits, to be sure, "are never directly observed," but if we are to give any plausible account of the continuity and consistency which pervade separate actions, "they are of *necessity* inferred."¹³¹ Traits, furthermore, function either as driving motives, or as merely directive or stylistic manners. Thus a man motivated by honesty may express this trait stylistically by brutal frankness or by diplomacy. It becomes clear that while a trait focusses and mobilizes lesser habits, skills, and attitudes, it overlaps, interpenetrates, and clusters with other traits. If a personality is sufficiently integrated, it will

be marked by the influence of a *cardinal* trait (or master-sentiment) in one's life, or at least of *central* traits.

We already have noted the part played by self-esteem and the ego-ideal in the organization of the personality. Traits represent the concrete pattern actualized within a personality whose reach usually exceeds its grasp. In recent writings, Allport has been impressed with the fact that "under conditions of ego-involvement the whole personality manifests greater consistency in behavior,"¹³² and that men are active, rather than re-active, participants socially to the degree that their *egos* are involved.¹³³ This ego, it would seem,¹³⁴ is that variable portion of the personality (cf. Koffka) with which the individual identifies his central values (traits, sentiments, ideals). It thus becomes at once a unifier and catalyzer of psychological capacities and energies, and the resultant of such mobilization. It would certainly involve cardinal or central traits, but its nature and extent is not static, being as it is a non-separable phase of the total personality. Apart from this important function, however, the ego plays a very important theoretical part as anchorage to the "new and somewhat radical principle of growth"¹³⁵ which is "altogether basic for the psychology of personality,"¹³⁶ namely, *functional autonomy*.

5. Functional Autonomy and the Ego. Convinced that a psychology of personality must be post-instinctive and avoid the suffocating restrictions of biological dynamics, Allport advocates functional-autonomy to render intelligible the process of human development.

"Somehow in the process of maturing the manifold potentialities and dispositions of childhood coalesce into sharper, more distinctive motivational systems. *Pari passu* with their emergence these systems take upon themselves effective driving power, operating as mature, autonomous motives quite different in aim and in character from the motivational systems of juvenile years, and very different indeed from the crude organic tensions of infancy."¹³⁷ . . . The dynamic psychology proposed here regards adult systems as infinitely varied, and as self-sustaining, contemporary systems, growing out of antecedent systems, but functionally independent of them. . . . Each motive has a defi-

nite point of origin which may lie in the hypothetical instincts, or, more likely, in the organic tensions and diffuse irritability. . . . But as the individual matures the bond is broken. The tie is historical, not functional."¹³⁸

Allport is high-lighting the fact that learning often transforms (he would say supplants) prior motivational energies, that earlier means do seem to become ends in themselves or new bases for motives. But another issue faces Allport besides that of the emergent magic whereby aesthetic and social needs spring from vegetative urges. Bertocci has suggested that if mechanisms do cut loose not only from the original but also from all innate purposive drives, the unity and longitudinal consistency of any acquired personality is no longer intelligible. This concern for the empirical and functional continuity of personality led Bertocci to ask for a unity-preserving account of the change from one motivational system to another, if persistent underlying drives are denied. Why are different and successive motivational systems functionally equivalent? What guides selection and what is responsible for discontinuance?

Allport clearly answers: "I regret ever implying . . . that motives fly off at a tangent and have no bedrock anchorage in the satisfaction of the ego . . . Motives, I contend, may be autonomous in respect to their origin but never in respect to the ego."¹³⁹ All motives "imply some form of ego-satisfaction,"¹⁴⁰ and trait-constancy ultimately depends on the capacity of a trait to satisfy the "living system of interdependent motives" which, after all, constitute the organism. "Hence it comes about that evolving motives reconstitute the ego even while dependent upon it for their viability."¹⁴¹

There can be no doubt that the acquired ego does indeed provide a better basis for "novel" motives and their selection. But as already has been suggested elsewhere,¹⁴² *the ego itself is a selected adjustment, it is itself functionally autonomous of primitive drives*. H. Cantril and Allport would agree that the ego, in the main, represents the interiorization of cultural values, but what is needed is an interiorizer, a selective agent-self (or what we called above, the psychological self) to choose among the adjustments and values which finally constitute the ego. Such a self, making its way not only among

established cultural values, but especially among those within its given range of abilities, temperament and needs, gradually selects the ego seemingly adequate to it, and changes it, insofar as it can, when it sees fit. The ego, a joint-product of the adjusting, knowing, wanting self, does indeed constitute a derived motivational pattern of values *within the total personality*. But ultimate anchorage for it would be in the evolving, time-binding, psychological self and its basic needs and abilities.

SUMMARY

We have seen how the empirical psychology of the concrete individual gradually emerged from philosophical concerns about the nature of unity and continuity, from terminological confusions, from the grip of typologies and generic constitutional elements, such as glands, instincts, drives, reflexes and factors. The inviting "mask" of personality has indeed brought many suitors, in the name of commonsense, the arts, religion, philosophy, biology, mathematics, sociology, physics, and finally "scientific methodology." But none of the suitors has won her, for they have sought to ensnare her by their formulae rather than respect her for her many-sided uniqueness. Receptive to the disinterested attention of each discipline, personality still defies attempts to partition her or to reduce her to a mere product of forces, or entities, or behavior, or fields, or confining procedures.

It may be, as MacKinnon has said, that: "A field theory of personality which sees behavior and personality as functions of a total field of which they are sub-parts is the form of theory which today seems best suited for the conceptual representation of personality."¹⁴³ But, on the other hand, it has seemed to the present writer that the intrinsic uniqueness, self-determination, and purposiveness of personality are not sacrificed as much if we take the point of view that the central feature of personality is the knowing-wanting *unitas multiplex*. This psychological self, which satisfies its needs according to its abilities within a social-physical field, gradually develops those enduring traits which in their interpenetration constitute the self's personality, a complex mode of adjustment vulnerable both to inner demands and outer exposures. The personality is not the product of an ambiguous field of forces, but represents

what a given unique self has created out of the forces and opportunities open to it in its *rapport* with the world.

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¹³⁴ See Bertocci, "The Psychological Self, Ego, and Personality," *Psychol. Rev.*, 52, 1945.

¹³⁵ Allport, *Personality*, p. 191.

¹³⁶ Ibid., p. 558.

¹³⁷ Allport, *Personality*, p. 190.

¹³⁸ Ibid., p. 194.

¹³⁹ Allport, "Motivation in Personality," *Psychol. Rev.*, 47, 1940, p. 547.

¹⁴⁰ Ibid., p. 549.

¹⁴¹ Ibid., pp. 549-550. See Cantril, *Psychology of Social Movements*, 1941, pp. 34-35.

¹⁴² P. A. Bertocci, "A Critique of Professor Cantril's Theory of Motivation," in *Psychol. Rev.*, 49, 1942, p. 373f.; and see Bertocci, Art. (1945).

¹⁴³ MacKinnon, op. cit., p. 43.

PERSONALITY, THE CULTURAL APPROACH TO.—The cultural dimension of personality may be looked at from two points of view. We may emphasize those aspects of personality which can be systematically referred to the regularities of behavior in the society within which an individual is born and reared, or to which he or she is exposed for appreciable periods of time, which taken together we call

"culture." When this point of view is taken, the student is interested in those aspects of personality which are common to all those who share a common culture; deviations and variations are of interest only as they serve to further define the "national or cultural character," or "basic personality structure" distinctive of the particular culture. Individuals are studied as samples of a type of behavior which is recognized as systematic. Thus the extreme emphasis upon personal bravery and warlike character among Dakota Indians, and the institution of the berdache under which young males who find the emphasis on bravery too great to bear, assume women's clothes and occupation, will be viewed together as data on an aspect of Dakota character which includes a demand for bravery and a possibility of refusing to meet the demand. The actual distribution of behavior types in which most young men accept the demand and only a few reject it, will also be taken as descriptive of the "cultural character," and as one method of comparing it with those cultures in which there is a single and less exacting demand for moderate bravery with minor deviations towards greater or less bravery. Similarly where types of culture character are recognized in which there are several possible expressions of some basic emphasis, such as extreme prudery and institutionalized prostitution, fastidious personal cleanliness and great tolerance towards public lack of sanitation, or great public cleanliness and lack of personal hygiene, extreme brutality combined with an exquisite appreciation of aesthetic detail, a controlled unemotional religion combined with societies of intense witchcraft behavior, etc., such contrasts, whether found to run through the behavior of the same or different individuals, will all be regarded as data on central themes of a varying number of facets and with varying types of emphasis. The task is to concentrate upon and describe those regularities which may be ascribed to social inheritance as distinguished from those which may be referred to individual innate characteristics (*temperament or constitution*) or to the accidents of the personal, idiosyncratic life history. Man's basic mammalian nature is, however, systematically included in any discussion of cultural character in the premise of the "psychic unity of mankind." Cultural differences are delineated against a common humanity.

The second approach to the cultural dimension comes with emphasis upon the types and varieties of personality *within* a culture when emphasis is laid not upon innate individual gift, nor upon individual history, but upon the way in which the institutions and formulations of the culture provide for such varieties. The recognized gamut of individual differences, the extent to which intelligence or beauty, strength or skill is singled out, approved, or completely discounted, is culturally defined. The same detail of physiognomy which among one people may entitle one to a position of beauty, may be classified as ugliness in another culture and ignored altogether in a third. One culture may have a concept of "the artist" which includes a destiny based upon having been born with the umbilical cord around one's neck, a second may push all individuals with talent into an artist-craftsman group, a third designate as artists only those who combine talent and deviance, a fourth make skill and artistry a function of clan or family membership. One culture may distinguish between the "serious" and the "naughty" so that people insist upon classifying all individuals in one group or the other and demand and get differentiated behavior from them, another may emphasize as an essential a vulnerability or lack of vulnerability to sorcery as shown by illness. One culture may demand a subjective and visionary experience from every male child and condemn to social unimportance those who fail to achieve such an experience while another may place such a slight premium upon any type of subjective experience that those who report such experiences are voted insane or possessed. Within cultures which recognize sexual inversion as a type of behavior to be expected and either approved or disapproved, such behavior occurs much more frequently than in those cultures which do not recognize such a possibility.

So, it is possible to consider personality culturally from this standpoint also, asking not what are the regularities which characterize every person who shares this culture, but what provision does the culture make for the development, the institutionalization, the maximization or minimizing of differences, whether those differences may be referred to heredity—as in the case of shape of nose or type of hair—to accident—as for instance when a child who has been scarred from a wound is regarded as

unfit for religious office,—to socially provided special training, as when certain individuals are selected to undergo a different education from their fellows, to physiological status,—as when women past the menopause are permitted male license, to social status determined either by heredity or social experience, or to various arbitrary combinations of these as for instance when personal bravery is approved in a man of rank and disapproved in a commoner, or when mathematical ability is rewarded in a male and ignored in a female. Although in any human group a large number of differences will be found which may be referred to temperament and constitution, and to historical accident, whether these differences are socially significant aspects of personality recognized by the group and by the individual who displays them, is dependent upon the culture. Even if differences between individuals are recognized they may be placed in an entirely different context, as when a European might say of a Samoan girl, "She has a lot of intensity," to be answered, "She's deaf," or of a Latin woman, "What a violent temper she has," to be answered, "She's a widow," or of an Arab man, "What a malicious nature he has," to be answered, "He has ringworm." Conversely, where an impartial observer might say of a student in a Middle Western school, "She has social status and so is popular," student vote might insist that she was the most beautiful in the class, even in opposition to American standards of beauty. The most striking deviations from statistically usual behavior, such as inversion, epilepsy, subnormal mentality, polydactylicity, musical or mathematical virtuosity, a rare singing voice, may go completely unrecognized, unpunished and unrewarded, while details of a quite different order, such as day or hour of birth, may be made the basis of a system of education or special privilege which differentiates one individual from another to a very great extent.

In most instances when students speak of the cultural determinants of personality, they tend to think of uniformities in the behavior of those who share a common culture rather than regularities. So a tendency to speak volubly and with emotion will be referred to Italian culture, but the extent to which some individuals speak very little and others a great deal will be referred to "individual differences" ignoring the

fact that range and contrast, even sharp contradictions among the behavior of individuals sharing the same culture are also "regular" and referable to the culture. Differences between the expressive and free behavior of lower-class Negro Americans and the restrained behavior of middle and upper class Negro Americans may all be referred to the class standards and race attitudes of American culture as well as "individual differences" between the expressive lower class Negro American who laughs loudly in a subway train and the quiet, well-bred young Negro lawyer who sits across from him. Even the extent to which individuals of one type or another may become involved in changing their class position is also culturally regular. So in a working class group where great vigor and lustiness are rewarded it may be the puny who aspire to changed status while in a group upon whom malnutrition and disease have laid their stamp, only the exceptionally vigorous may have the necessary physical qualifications for changed social status. Perhaps the simplest illustration may be found in the way in which men and women do their hair in present-day America, the men with a high degree of uniformity, the women with greater emphasis upon conformity to rapidly changing fashions and distinctiveness within the fashion. Looking at a mixed group, the men's appearance is much more uniform than the women's. Each type of behavior is to be referred to the culture, but in the case of the women the culture has institutionalized a degree of individuality; in the case of the men, non-individuality has been emphasized. Once the concept of "regularities" rather than "uniformities" is fully accepted, the confusions which so frequently arise between what is cultural and what is individual is dissipated, and we can distinguish instead between looking at behavior "culturally" and so stressing the regularities and looking at behavior in terms of "individual differences," stressing the innate and the idiosyncratic. The student of individual differences may wish to choose culturally regular behavior within which the allowance for individual variation is small so that very minute differences are significant—as would be the case in any attempt to use male haircuts as data, in our society, or large, if male hair arrangements among the Usiai of the Admiralty Islands were the subject of study.

Even the extent to which differences in life

history experience will become significant in the life of an individual, has a cultural component. Some cultures permit individuals to relate themselves to a line of inheritance, others to a series of achievements or failures in the educational system (as in traditional Chinese society). Today under the influence of Freudian psychology, individuals are culturally permitted to phrase current success or failure in terms of the treatment they received in early childhood. In some cultures, as for example the Latmul, the sense of personal differentiation of the self is so weak that a youthful informant asked to relate his own life history will pass his present age and continue to describe a culturally approved career line which he has not yet lived through, without any sense that this life is not yet his because he has not yet lived it. In cultures, like Bali, where the future is thought of as already in a sense past and determined, chronological sequence becomes virtually meaningless, and people date a finished work by the week and month, but omit the year. Studies of life histories are a revealing method of counterpoising an individual's idiomatic version of his culture against another type of description of its regularities, but the form that his idiom will take, the type of details which he will select, the sorts of omissions which he will make, will be found to be culturally regular, in spite of the deviant circumstances of his life, and the strength and originality of his temperament. Dreams and visions have been continually demonstrated to be limited to very narrow confines by the culture, and when memory experiments are made, individuals from different cultures, presented with a foreign tale, in recall give it a cultural as well as an idiosyncratic stamp.

All formulations which seek to class phenomena, or facts, as "cultural," "psychological," "individual," "idiosyncratic," "somatic," fail to recognize that all of these categories are categories of observations, points of view taken by science, and that all phenomena of human behavior may be looked at from each of these points of view. There are no "cultural facts"; there are merely orders of data which those who are interested in studying the cultural aspects of behavior, have found it most convenient to analyze. An individual's behavior in a memory experiment, or a multiple-choice reaction time experiment, or a test in which a psychogalvanometer is used, is culturally patterned,

but such material may not be the most appropriate for cultural analysis.

It will be useful for students of personality to recognize which types of cultural study provide them with which types of material. In the two branches of the "functional school," represented by Radcliffe Brown and Malinowski, individual differences between human beings were purposely held rather constant, and the emphasis is upon the way in which societies vary in their institutional arrangements for satisfying the same needs—hunger, love, social solidarity, etc. Structural differences in institutions, and differences in the way in which they function are studied so as to throw light upon the nature of human institutions, their possible range, the type of population for which different institutions are most appropriate, etc., and to arrive at methods of classification which will apply to all known cultures. These materials yield extraordinarily little that is immediately relevant to the student of personality, except as a by-product of rich detailed field material, or brilliant descriptive writing. Systematically, even the differences between cultures are only significant as a method of arriving at a statement of similarities at a higher level of abstraction. Only the beginning student of personality who still needs, for instance, to get a picture of the very different forms which the human family can take and the different ways in which it can function, will find this approach relevant.

The historical approach to culture which developed in America under Boas emphasized both the distinctiveness of each culture, and the dependance of each culture upon the availability of different sorts of cultural invention and upon historical circumstances such as migration, contact, etc. The common heritage of human beings was again heavily emphasized, and the "culture area" concept which described the regularities inherent in a group of cultures carried by people who had been historically in contact with each other, was a systematic way of referring the behavior of members of each culture to a wider base. This culture area approach may be used in certain types of discussion of personality as when we say that shame as a sanction governing behavior is characteristic of the North American Indian, although its use may vary from a complete dependence upon being found out and ridiculed, through a culturally cultivated ability to be insulted all alone in the middle of

a lake by the failure of a paddle to yield to one's skill. Discussions which find it useful to recognize certain historically and geographically relevant emphases which are wider than single tribes or native states, as when we wish to use the term "European" in discussing land tenure, or "Continental American" in discussing for instance, the way in which the mother's role in the child's life has been maximized at the expense of the father's in both North and South America, find this culture area approach valuable. The same basic methodology makes it possible to discuss "Catholic" aspects of personality development, or "Protestant" or "Buddhist" emphases, in which a traditional religious form which transcends boundaries carries with it some definite implications for personality development. The culture area approach may be seen as a systematic method of defining limits within which history may be assumed to be constant. It is assumed that all of the cultures in a given area have had access to all the themes characteristic of that area. This approach can be contrasted for instance, with an explanation which would ascribe those aspects of Rumanian character which the Rumanians share with other Rumanians, to a series of local events within Rumania. Under the culture area approach, the student would instead emphasize that these aspects of the Rumanian character were a stated version of "European character." This American historical school was not preoccupied with the study of "cultural character" or individual differences, so that its contributions to the study of personality, are either on this theoretical level, or in terms of a wealth of rich, verbatim materials which require considerable background to interpret.

During the last twenty-five years there has been a strong emphasis in anthropological study and in the related fields of social psychology, sociology, psychiatry, and psychoanalysis, upon the importance of what has been called, not very happily, the culture *and* personality approach. The *and* originally introduced to link fields, has proven to be a methodological embarrassment. The recent psychosomatic movement when interpreted at its broadest is a further, more systematic phrasing of the essential unity of the individual *in* a culture and the need for insisting upon a recognition of this unity, while his behavior is studied from a variety of points of view.

The earliest efforts in this field involved using cultural data, and making actual field investigations, to call in question theories developed within our own culture by students of personality such as G. Stanley Hall, Freud, Piaget, etc. The data on personality in other cultures were examined and arranged to show that human beings were more flexible, less rigidly channeled in given directions, than the theorists who had not had the benefit of comparative cultural study had imagined. This method of subjecting any psychological theory to the test of cross cultural applicability has become a routine test of all theories of personality development. Yale University has developed a "cross cultural survey" in which assumptions can be tested against classified data on many aspects of many cultures. In those cases where the material is adequate—which unfortunately are not many—it is possible to test out an assumption as to whether a certain type of child care—i.e., swaddling to a cradle board—is regularly found with certain types of stoicism under torture, etc. While the emphasis in the use of comparative cultural materials has for the most part shifted away from this function of merely calling in question or reaffirming some current theory, this use also survives as in the arrangement of data from a different culture to illustrate rather than test a theory, as has been done by several members of the Yale School with the Stimulant-Response Learning Theory, and by Roheim whose interpretation of Freudian principles was enriched rather than altered by his extensive primitive researches. Where the investigator uses a theory which has been developed in one culture as a tool to investigate another culture, but holds himself hopefully ready to let the new material modify the hypothesis, theory can be very useful, but where the student of personality is asked to take the trouble to master the details of an alien society merely to reaffirm some theory which can be studied more economically within our own, the effort is doubtfully rewarding. A curious backwash of the earlier use of cultural material to call in question some of the culturally-limited assumptions of Freud, has occurred in the application of the term "cultural school," to the approach of Karen Horney, whose work actually makes no systematic allowance for culture but does question parts of Freudian theory.

Meanwhile comparative students have developed more positive approaches to theories of

personality, using cultural explorations to broaden the basis of theory, add facets which would not have occurred easily to students of personality who operated only within our own society, and raise the level of abstraction in which theories are couched. Examples of such broadening are the addition of an emphasis on skin and extremities, to a theory of personality which laid great stress on the body orifices alone as the basis of personality formation, of the inclusion in a theory of learning in which goal oriented behavior is one of its necessary conditions of the possibility of behavior which could not be said to be goal-oriented in the same way, or adding to theories of personality which assume a necessary expression of personality conflict in parties, factions, etc., detailed studies of those societies in which none of these phenomena occur. Instead of Malinowski's classic demonstration that the attitudes which middle class Vienna reserved for the father, could be split—in the Trobriands—between a loving father and a stern mother's brother, we now have statements of the "Oedipus" situation which state broadly the great importance of the child's relationship to adult figures of each sex, without specifying the number or exact family relationship of these figures.

The approach developed by Benedict treats a culture over time as analogous to a personality over time, in which the basis of selection of certain types of behavior and the rejection of others can be much more consistent and highly integrated than in the life history of a single individual. The impetus given culture towards the development of such a pattern, which is delineated not so much in the interpersonal relations of individuals as in formal elements in the culture, religion, myths, formal speeches, magic, is regarded as a combination of historical accident and the selection and reinforcement of certain human potentialities at the expense of others. These potentialities are themselves derived from a study of comparative cultures plus a generous allowance for the occurrence of other unknown potentialities as exotic as those which have been recorded. In this respect Benedict's work resembled Malinowski's. He derived his human needs from a study of cultures, not from a study of biology, and then proceeded to describe the similarities in the institutions through which all cultures meet these needs. Benedict derives her sense of man's potential range from

the various cultural expressions which are available for study and then concentrates on the differences between cultures which have specialized in one or other of these potentialities. Her material is then presented as data on range of potentialities and as illustrative of the uniqueness of each cultural version of those potentialities. Benedict's theory may be regarded as the most culturally based theory of personality, as it does not rely upon any assumption of systematic differences in temperament or constitution, nor upon any theory of limited possibilities. My study of Sex and Temperament, Bateson's Naven, and Bateson's theory of deutero-learning which assumes a limited number of types of learning which may be differently combined and elaborated in different cultures, Gorer and Erikson's use of the body image as a basis upon which personality is built, all assume a systematically limited set of the particular potentialities of mankind which have been developed by a given culture. The use of Benedict's method cross culturally leads to further data upon the process of historical development of cultural uniqueness, while these other approaches lead towards a development of a theory of personality development in which the approaches of other sciences are invoked as well as the cultural. Kardiner's approach involves the acceptance of historical accident as necessary to his argument, as in his handling of the high male ratio in the Marquessas as an effective cause rather than as a condition under which certain types of personality development takes place.

Studies of ego formation, in which attention is directed to the sanctions and surrogates which different cultures use in developing individuals who will function satisfactorily within their special limits, bring out rather sharply the present state of our knowledge. We have accounts of character formation in which the primary sanctions invoked are fear, anger, dependence upon love and authority (guilt), and shame (introjected standards of a group which is not wholly respected) and honor (introjected standards of others' respect for self), but we have no way of knowing whether this exhausts the possible categories of ego organization, nor whether our present continuum between degrees of internalization or externalization of standards is the only relevant one.

Students of the cultural dimension of personality can work from several quite different

angles and arrive at internally consistent results because of the complexity and internal consistency of the material with which they deal. The concept of culture rests upon the finding that items of behavior of many different orders, a gesture, a relationship between parent and child, a method of addressing the deity, a convention for the composition of poetry and a system of mortgaging property may all be seen as systematic. As an analysis of any series of these details—as the whole range of inter-personal relations, the art forms, the religious beliefs, or the methods of commercial behavior, is designed primarily to be a way of studying the whole, of defining either the whole culture or the culturally regular character of a carrier of that culture, a valid analysis of any one series makes it possible to derive the whole from it. So it is that approaching a study of a culture from the standpoint of the body and outlining the ways in which different parts of the body, particularly orifices and limbs and eyes, are treated in the developing child, if carefully pursued will produce the same type of generalization as may be obtained from a study of developmental history of children or from an analysis of the pattern of inter-personal relations such as Bateson's use of the place of parents and children in a series of paired relationships such as spectatorship-exhibitionism, dominance-submission, succoring-dependence. Bateson was able to show that many of the conspicuous and regular differences between English and American social practice may be referred to a reversal in the parent-child position, as in England the father is the actor, the child the spectator, in America the child acts and the parents are spectators. Benedict's type of analysis in which a series of variations on a wider spread theme, such as different European attitudes towards inheritance, wife's handling money, meaning of adolescence, interpretation of the historical events of the 1840s, etc., may be analyzed to give a picture of the personality of a given European society, also cross checks with these other approaches. Students who are accustomed to think more about the validity of a given method than about the wholeness of the phenomena which they are studying are sometimes puzzled as to *which* is the valid approach to the cultural dimension of personality. Actually the question is neither one of validity nor reliability but rather of availability and accessibility

of different types of data, and the temperamental or theoretical slant of individual workers. All the disputation as to the relative advantages of one approach or another is rooted in methodological arguments which are actually extraneous to the issue, the accurate delineation of the culture in such a form that cross cultural comparisons can be made, cross cultural abstractions constructed, and our frame of reference for the understanding of personality widened. The most recent work in psychosomatic medicine in which a diseased condition can be referred to the character structure of the individual, which can in turn be referred to his culture, provides a sort of synthesis of all of these approaches. A shifting disease incidence, as in the shift recorded by Mittelman and Wolff from women to men in incidence of gastric ulcer, can be taken as data on historical change, or in turn data on historical change may be used to reinforce the understanding of the cultural and idiosyncratic dimensions of gastric ulcer.

All of these modern approaches have in common the acceptance of a common humanity in which the characteristics upon which racial classifications are based are relevant but which recognizes a wide range of individual differences and temperamental potentialities. Whether this range is regarded as embracing a certain number of constitutional types or a limited number of possible directions of variation, or whether no such limitation is included in the hypothesis, all work in this field emphasizes the development of personality within culture, individual organisms interacting with other individuals whose behavior has been formed in the same process, under the same set of institutions. Types of behavior which we customarily regard as generically human, which include the use of language and the use of tools, already of course, involve a cultural dimension. We would not accord full humanity to an individual who had been reared without the intermediation of other human beings whose behavior was already culturally patterned.

In addition to the conceptual differences in approach to the problem there are a series of different methods of studying personality in culture, three of which are of special interest to psychologists: (1) the life history approach, (2) the observational cross section approach, and (3) the use of projective tests. It is impor-

tant to emphasize that while it is possible to reach the same generalizations by the use of any one of the *approaches* discussed above, because all of them are rooted in an orientation to the whole culture, the same thing cannot be said of all *specific methods*. Methods which have been developed in psychological research and are focussed upon non-holistic aims, but rather upon the need for a measure that is valid and reliable, cannot be relied upon to present a sufficiently representative sample of a culture so that the whole can be constructed from the part which is revealed by the test. This is essentially because most of these methods, with the exception of projective methods, are not a way of eliciting the pattern in the material but rather of forcing pattern *upon* the material. The patterns enforced are a product of our own society in its particular manifestation of scientific thinking, and may do excessive violence to the culture in which they are used. For example the life history method, in which a single individual or a number of individuals relate their autobiographies, involves an attitude towards sequence and chronology which is absent from many cultures and also necessitates an allowance for retrospective falsification, suppression, distortion and displacement, which can only be made completely if there are other cultural data from which the nature of these processes in the particular culture can be derived. Cross sectional observational studies, while less formal and so doing less violence to the material, nevertheless when formalized may introduce units which are irrelevant, either in the age sections chosen for observation or the units of behavior into which the observation is arbitrarily forced. Tests of a more formal nature, such as tests of intelligence, personality inventories, etc., are obviously so much a function of our own culture as to be generally unsuitable for cross cultural use. The Stewart ring puzzle test, a three-dimensional manual maze test with graduated levels of difficulty, comes close to being a cross-cultural test of intelligence precisely because it involves so much of the whole personality; persistence and concentration, degree of goal orientation, etc., being involved as well as visual, manual and kinaesthetic manipulation.

Projective techniques involve a hypothesis about the whole personality which is completely congruent with a cultural approach. Most of

the tests which have been devised to discriminate between types of personality in our own culture can be used as cross cultural tests of cultural character, once adequate culturally relevant standardization has been developed. In a test like the Rorschach, the present method of scoring and interpretation is designed to hold both temperament and culture constant and concentrate upon the developmentally-idiosyncratic pattern of the individual and so is not highly adapted to cross cultural use. The Goode-nough test, the "Draw a Man and a Woman Test," the use of family dolls, etc., all serve to demonstrate cultural dimensions to those who are familiar with the tests but unfamiliar with cultural thinking, and provide a convenient form for comparative work between our own culture where such methods are widely used to discriminate *individual* differences, and other cultures. To date, it has not been demonstrated that they reveal any aspect of culture which cannot be arrived at by other means, which is a claim which can be made for projective tests (as a type of test) in the study of personality within our own culture. Their use in cross cultural studies is primarily justified by a need to communicate with workers in other fields of personality study.

Another question which is frequently raised is the role of experiment in cultural studies. In the first place, cultural study is at the present time a clinical science. The aim of training is to develop an individual who is sufficiently well versed in the perception of pattern in the phenomena of human behavior so that he or she will be able to delineate the pattern of a given culture. While there is continual pressure to develop cross cultural abstractions which will bring more phenomena within a single frame of reference, there is as yet no hope of producing abstractions which can be arrived at by any foolproof means, such as a test which can be administered by an experimenter ignorant of the theory on which it is based. Although increasing techniques for the collection of kinship systems, for instance, have made it possible for less gifted research workers to bring back fuller material, these improvements have not kept pace with the constantly accelerated demand for greater theoretical sophistication which must be included in the observations when they are made. Attempts to use still and moving-picture photography to standardize observations have

only revealed the importance of the observer's point of view, which is as significant an element in anthropological field research as is the "transference" phenomenon in psychoanalytic investigations.

So it is necessary to distinguish between the "cultural" approach, recently very well described by Kurt Wolff, and the "objective" approach which has been the aim of much of psychology and some anthropology. In the first approach, the investigator is included within the observation; any observation is regarded as a product of the culture of investigator and culture of the individuals being observed. By comparative means and the accumulations of observations made from different cultural approaches it is hoped in time to establish a science which will be comparably usable in different cultures. But this approach does not hope to arrive at scientifically valid results by *excluding* the investigator nor by holding the investigator constant.

The study of culture is primarily an observational science which relies upon the necessary conditions having already been created by history. Students take the trouble to journey to a strange society, learn the language, and study the culture in detail in order to benefit from the natural situations which occur there because cultures have been historically differentiated. Experiments tend to force our frame of reference upon the individuals in these other cultures, even more drastically than do tests, just as maze experiments force our theories of learning on the rat. There is an essential contradiction between the experiment which relies upon the competency with which the experimenter imposes his conditions and the method of observation in which the observer finds his answer the more completely he leaves the conditions unaltered. While a certain number of experimental methods, such as memory experiments, may be necessary for purposes of cross disciplinary communication, there seems no reason to believe that experiment is a very fruitful way of studying the cultural dimension. In occasional instances as where knowledge of a culture is lacking, and action in that culture is imperative, as in the problem presented by the need for planning for the reeducation of German youth in 1945, experimental set-ups which parallel situations in other cultures where more of the relevant factors are controlled may be short-cuts to action plans. But this is due to the

need to apply knowledge before knowledge has been obtained by better means, not to the greater suitability of the method.

Method in this field is primarily oriented towards a recognition of the systematic nature of human behavior, towards a recognition of the inter-relatedness and integration of all of the details of a culture, rather than to specific techniques of analysis. In this respect the general cultural approach stands to the methods of psychological testing very much as the general clinical approach stands to the specific diagnostic techniques of the laboratory. Conceivably as psychology takes more systematic account of the cultural dimension, specific, finely calibrated tests may be developed which the anthropologist can use with the same reliance as a clinician places upon urinalysis, blood analysis, etc. But even so, both clinician and anthropologist have to refer the sets of specific findings to another frame of reference, the total personality for the clinician, the culture for the anthropologist.

So far we have been discussing the cultural dimension as it applies to the regularities of personality within a given culture. We may now turn and examine in more detail the various patterns of difference between personalities within a culture, which can be referred to the culture.

One of the most important forms of such differentiation has been discussed by Linton under the heading of status. Some status attributes are regarded as virtually inalienable aspects of personality, such as sex and age, rank and caste, lineage, date of birth, place of birth, order of birth, nature of birth (e.g., child born in a caul), legal status of birth, etc. There is no one of these, some of which we regard as inalienable and significant and others of which we ignore, which some human culture has not regarded as less significant, or reversed the "natural connotation," even of age and sex. In Bali the sounds made by infants are invested with the dignity of supernatural revelations; in some societies the very old are reduced to child stature. Complete sociological change of sex, including transvesticism, change of occupation and removal of all barriers to acting as a member of the opposite sex, occurs in many societies.

However, whichever types of recognition a culture accords become important conditions of personality differentiation. Whether children are supposed to be quiet and mouselike, or

noisy and troublesome the quiet fearful child and the active aggressive one have different fates and respond differently to demands congenial to one and uncongenial to the other. Whether women are supposed to be meek, responsive and clinging, or bold and initiating, the variably successful attempts of different women to approximate the cultural expectation is an important factor in personality formation. The society which believes witchcraft is hereditary in the female line singles out the girl children of alleged witches and treats them so differently from others that the girl almost inevitably develops a personality to which witchcraft may plausibly be attributed. Princes and nobles, given special treatment from birth, surrounded by servants and subjects, develop very differently from commoners. The child without a name may hang its head in shame or carry it too high, but because its culture has decreed a difference between those born in wedlock and those born outside, it will never carry its head just as it would have if no such distinction existed. The seventh child of the seventh child is oriented towards clairvoyance differently from its brothers and sisters. So it may be said that every structural complication of status which a culture includes, which carries an attributed difference in personality or an attributed expectation of or right to different behavior, will contribute to the diversification of personality within that society. Depending upon the type and strength of the cultural pressures, such structural definition may actually produce different personality types in nobles and peasants, each systematically related to the whole culture but differing consistently as between the two groups, or the stylization may merely result in the aristocracy rejecting its own members who show "peasant type" behavior, and giving every opportunity to any member of the lower group who shows himself of "noble mien" to rise. But whatever type of resolution between assumed personality ascribed to a status with which there is no necessary connection happens to occur, the range and type of personality difference within the society will be a function of such cultural distinctions.

It is also useful to discriminate the cultural patterning of personality differences by the emphasis laid upon such situations as being an only child, the child wife of an old man, which may be culturally usual in one culture, treated

as exceptional in a second, and ignored in a third.

Kinship may be patterned so as to give the same individual a chance to play a variety of roles and so express a greater number of facets of personality without, however, increasing the degree of differentiation as between individuals in a society. In such societies as the Bathonga of South Africa, many primitive Australian tribes, and the Crow and Omaha Indians, for instance, a man treats certain relatives with respect, others with familiarity, others authoritatively, others perhaps with avoidance. This often means, as in Bathonga, that every person has a chance as an adult to live out different sets of inter-personal relationships, to treat his own child sternly and a sister's child indulgently, for instance, yet because these roles are enjoined upon everyone their diversity may actually tend to reduce personality differences as among individual members of the society. Greater authoritarianism or greater tendency towards giving or receiving indulgence will be masked by the large amount of institutionalized outlets permitted. In a very simple society such as the Temiar of Malaya, the difference between the shaman and the rest of the group may on the other hand constitute an enormous difference in personality, a different order of personality integration being required of those who achieve shamanship. At every turn it is important to ask both what is the degree of differentiation, the number of similar roles permitted to every individual in terms of age, sex, occupation, kinship status, place in hierarchy during their lifetime, and also to what extent are these structural details patterned to differentiate *among* individuals. Where kinship is very important, the circumstance of being an orphan, the last of the line, the single member of a clan, doubly adopted, etc., may serve to place the individual in a position where others behave to him with, and expect from him, very different responses, as he is expected to be lonely, misanthropic, independent, lacking in independence, etc., according to the cultural emphases. It also makes a great difference whether a society permits contrasting types of behavior, such as sexual license, drunkenness, in those who are ordinarily circumspect, at a given period in life, at a given period in the year, or only to those who are on the point of leaving for battle, being

offered up to the gods, or who belong to certain religious societies. In the first case, everyone who lives through a normal life span will have both sets of experience, control and license, and everyone's personality will reflect systematically the alternation. In the second, the license given to some and withheld from others will have a different sort of reflection in personality differences.

Perhaps this contrast is brought out most strongly if one compares two mechanisms, that of different treatment of children because of their present position in the family (youngest, knee baby, third from the last born, etc.), and because of order of birth. When children receive several types of treatment in sequence, there is a complication of each personality structure, as the developing child experiences each step in the sequence. It seems possible to refer some of the puzzling differences between cultures as to the depth and variety of their symbolic systems to the extent of this sequential variation by which a child may be first pampered, then ignored and then given responsibility for the new baby, before it becomes a member of a large, relatively homogeneous "children's group." But each child in turn, even the youngest in a single family, receives this sequentially differentiated treatment from all the members of the society. The end result is a richer culture, a richer cultural character or basic personality structure, but not necessarily any greater differentiation *among* individuals. Although as a general rule, the more complexity a culture has, the more possibilities for the diversified realization of personality exist, the masking effect referred to above may obscure temperamental differences which would be more sharply accentuated in a culture in which men and women, or members of different classes are sharply distinguished in cultural usage. Order of birth differentiation, like sex, rank and caste differentiation, is of this latter type, and where strongly emphasized it may be possible to tell at once whether a given individual is an eldest or younger son, the son of a man of rank or position, or as is the case in Manus, there may be a combination of rank and situation so that it will be possible to distinguish among the sons of a man of rising importance and recognize which child was at the most formative stage when his father reached a peak of social importance. Or, instead

the differentiation may be between households, as in Samoa, or even between villages, and individual differences may be muted to the emphasis of an extended family or a whole hamlet.

In addition to recognizing these two extremes of cultural patterning of individual differences, where each individual is patterned in the same way, and where there is a highly culturally patterned degree of difference among individuals, it is important to recognize those areas in which there has been no cultural emphasis of any sort, which are perhaps the crucial instances for the study of certain "natural" or universally human, or constitutional differences. Cultures may be highly animistic, or insist on a high degree of objectivity—like our own, or there may be relatively little interest in whether individuals conceive the world in animistic and arbitrary, or mechanistic, cause and effect terms. In such cases difference in imagination and style of interpretation of casual events will be found, if the behavior of individuals is observed carefully. The same holds true of order of birth in a culture which is uninterested in the subject, which has no terminology for birth order, no privileges or duties or expectations according to order of birth. Just how much we may attribute the differences or similarities in animistic thinking, the differences between children of different birth order, etc., which are found in such cultures, to some universal or constitutional difference, and how much they must still be regarded as inarticulate but patterned reflections of other areas of the culture which are articulately patterned is a problem which awaits further study. A striking example is the occurrence of marked phonetic differences in pronunciation between individuals who live on the border of a phonetic shift within a common language, such as so often occurs in Oceania, where one group may use a *k* and another a glottal stop, or one an *r* and another an *l*. If the border line is vague, there will be found a consistent variation between individuals, some always using the *r*, the others the *l*, where the culture permits either. This may reflect a true temperamental difference, or be a hidden but still patterned form, of some characterological phenomenon like resistance or acceptance of parental authority.

Finally, one of the great unanswered questions of the problem of personality in culture is

the extent to which it is possible to assume any system of drives, internal impulses, or physiological functions, which remain relatively unpatterned by the whole cultural process, but are simply differentially converted, displaced, sublimated, satisfied, etc. There is some evidence to suggest that there is a level of personality, which reappears in extreme schizophrenia, which may be remarkably unpatterned. Some drawings of schizophrenics partake of the nature of the drawings of schizophrenics in other cultures, rather than of the nature of drawings by sane members of their own culture. On the other hand, drawings by paranoid schizophrenics in the United States in the Abel (Free Designs of Limited Scope as a Personality Index) test and drawings by socially functioning Balinese artists are indistinguishable, while the drawings of other exotic peoples on the same test reflect cultural superstructure rather than what appears to be here, a more basic organization of personality. The extent to which the "primary process" in Freud's terminology, is actually culturally patterned has never been adequately investigated because the investigators have taken too heavy a theoretical paraphernalia to the interpretation of the phenomena of other cultures. Psychoanalytic phrasings of the nature of drive expression and stimulus-response phrasing of the nature of learning, and the human needs phrasing as the basis of all institutional superstructures, all provide workable descriptions of other cultures and of the process of personality formation within them, but none of them permits a sufficient amount of theoretical freedom for the student of personality to learn more about theoretical possibilities from the concrete data of each culture studied.

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PERSONALITY, MEASUREMENT

OF.—Personality, used as describing certain factors in the total individual, may be interpreted in various ways, depending on the point of view. Objectively, we can say that it is that which we do in relationship to other people. We may also take the position that it is that and more, that it involves the motives which influence our actions and our character. Or we may say that it consists of the effect of a combination of inward personal experience and outward social behavior. As Dashiell¹ puts it, an individual's personality is, "a sum total of behavior trends manifested in his social adjust-

ments." Psychiatric interest in the individual began approximately 160 years ago in France when Pinel humanized the care of the insane. Along with this interest came a concern for classifying, if possible, the mental disorders. This gave him an opportunity to recognize individual variations among the institution inmates. Griesinger and Kraepelin following Pinel, sought to refine and delimit his work. Both were much interested in observable effects. This type of approach to the problem was used until close to the end of the nineteenth century when the psychoanalytical point of view, with its major emphasis on early developmental influences and dynamic relationships began to make its influence felt in the field of psychology. Bleuler and Adolph Meyer bridged the gap between this early method and that of the Freudian group.

The contributions of Freud and his associates, Jung and Adler and Levy, to the area of personality cannot be underrated. They may be said to have fathered the practice of personality testing. To Freud we are indebted for the work in breaking the personality into the *id*, the *ego*, and the *superego*, and the theory of the building of personality by the interplay of these three factors. Jung's contribution of the doctrine of complexes, Adler's theory of "individual psychology," and the work of Levy in the guidance approach to the study of personality laid the groundwork for the next step, measurement of the personality.

As a result of the introduction of psychoanalysis there was a direct interest created in the study of the earlier years of the child and their influence on later behavior and personality development. This helped to give the present child guidance movement individuality. The growth of the mental testing movement in psychology dovetailed into the interest of the psychiatrist in individual variations. The psychologist now stepped in with a measuring device which was especially applicable to children by which their intelligence could be weighed precisely and objectively. Next the psychologist produced a means of measurement of the individual aptitudes and capabilities especially in the fields of education and vocations. This definitely enlarged the scope of the child's total personality.

The story of the child's environment is im-

¹ Dashiell, J. F., *Fundamentals of Objective Psychology*, p. 551, Houghton Mifflin Company, 1928.

portant in understanding the development of the behavior and the personality of the child and the later adult. It also gives direction in the treating of undesirable deviations. Research in this area has not been extensive nor has it yielded an abundant harvest. Nevertheless reliable personality tests have been constructed. The most serious impediment to the whole personality trait testing program is the apparent inability to find a sure method of determining validity. Since validity not only presupposes that a test measure that for which it was constructed but also the significance of the trait which is measured as well, the problem presented still calls for considerable research. The cause of the difficulty in this area lies in the fact that although people differ one from the other in personality, the differences are not sharp and clear and the traits are not capable of placement in categories by which the tests might be validated. Diligent search has, as yet, produced little in the way of sifting out and classifying individuals by their personality traits. When the validity of a test is questionable, then any interpretation which might be made of the results of the test would necessarily be questionable. Until there is some definite means of obtaining tests of high validity any use of personality test results must be made with considerable care. Used in conjunction with achievement tests in the field of guidance, they serve an invaluable purpose in supplementing and reinforcing the results of those tests. Some attempts have been made to validate personality tests by correlation with a judgment criterion. Since judgments of abilities are subject to considerable errors, any validation of a test by this means is open to question. Many statistical psychologists take the position that if a test measures a trait reliably then the measurement of the trait is valid. This calls for the inclusion in the test of only those items which contribute to the total score. The next step then "involves determination of the maximum validity possible . . . afforded by a statistical or mathematical validation and not by correlation with an outside criterion."²

Another method used in an attempt to validate personality tests is to correlate the tests with outside criteria, of course with full knowl-

edge of the errors involved. Correlation coefficients obtained in this manner are obviously low, probably averaging between .40 and .50. Until some definite method is evolved for obtaining greater validity, interpretations of the scores of personality tests must be accepted with caution. The interpretation, then, can be only indicative of possible behavior and not prognostic.

The various ways by which attempts to segregate and identify personality traits in individuals by personality tests may be classified under three headings, rating scales, questionnaires, and inventories.

RATING SCALES

In this area there are two divisions, (1) rating by trained observers or raters, and (2) self rating. In locating personality traits by two or more observers or raters, certain precautions are generally taken to make the rating as valid as possible. Raters are cautioned against committing the "generosity error" by giving their acquaintances the benefit of any doubtful judgment and against the "halo effect." Raters should of course be free of bias, and be well enough acquainted with the individual rated so that their ratings are more than a mere guess. Pooling or combining ratings of various observers is generally accomplished by each rater turning over his rating sheet to a computer or the raters meet and compare notes and as a group attempt to agree on a rating for the individual. It is obvious that the validity of any such personality rating is very low, although reliability may go as high as .80.

Self ratings probably have a tendency to be rather higher than observer ratings due to the human desire to appear better than the average of society. Among the self-rating scales validity is not conceded even by the makers to be very significant.

QUESTIONNAIRES

A questionnaire in general is a list of questions which the individual is expected to answer by checking or writing "yes" or "no." From the viewpoint of Psychology this method is designed to have the individual reveal by his checking where he stands along a given dimension of his personality. Some of these questionnaires, particularly the "trouble questionnaires"

² Patterson, D. G., Schneidler, G. G., and Williamson, E. G., *Student Guidance Techniques*, p. 171, McGraw-Hill Company, Inc., 1938.

reveal a rather high degree of reliability. Validity, however, depends considerably on the use to which the scores are to be put. If its purpose is to discover neurotic possibilities, its validity can only be determined by waiting over a long period of time until those who showed neurotic tendencies develop personal difficulties from which those without the tendencies remain free. This method, however, has many exceptions.

In tests to determine emotional stability in an individual, it is possible to have errors entering into the checking by those who have been coached up on the type of answers expected. In the study of individual differences the trouble questionnaire may be of use. It may receive some validity in this area by subsequent interviews with the individuals who checked it. Even then the validity of the questionnaire is low.

Questionnaires have been prepared in great numbers for many other traits, to aid in correct vocational choice and for revealing the trends of the many interests of an individual. They are also prepared to measure attitudes on many questions such as, economics, religion, politics, etc. Fortune and Gallup polls are of the more widely known types of the questionnaires. The Bell Adjustment Inventory and the Johnson Personal History Record are of the questionnaire type.

INVENTORIES

This kind of testing covers a wide range of traits varying from the performance tests, personality inventories and the imaginative responses of the Rorschach type. Performance tests seek to discover the individual's interpretation of character traits which are the basis of personality, such as honesty, generosity, persistence, etc. Personality inventories attempt to measure traits of personality adjustment. They may be of the questionnaire type as the Bernreuter Personality Inventory which purports to measure six traits. They are generally of use as indicators of symptoms of maladjustment. As yet personality inventories are still in the experimental state.

In the Rorschach Technique, using the imagination in conjunction with the inkblots, it is claimed that the individual reveals indications of his interests, preferences and emotional trends as well as his abilities and experiences. If it were possible to induce the individual to

free his imagination completely and talk freely at the same time, he might reveal his personality in this test. It is similar to day dreaming. In order to obtain anything more than a weak impression of the individual's mind from this test it is necessary to compare the responses of many persons. In the Rorschach method this has been done and a system of scoring has been worked out. The validity of this test may be checked by analyzing the individual's personality by some other means and comparing with the Rorschach results. Although in some instances the check has come out in favor of the method, there is still much more to be done before it can be used as more than a means of indication of the probable traits of the individual's personality.

The lack of validity which is a grave fault of personality tests does not necessarily prevent their use. They can be of great value to the individual tested and to the examiner as a means of obtaining insight into mental characteristics which are otherwise overlooked. The proposing of the questions tends to focus the individual's attention and thinking on those areas which are in need of remedial treatment. Such personality features as defects of character, annoying mannerisms, and inefficient actions may be revealed by these tests for the first time. To this extent the existence of the tests is justified.

Much work needs to be done in the testing of personality traits before they can be called adequate measures of personality.

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PERSONALITY DEVELOPMENT, THE ROLE OF THE FAMILY IN.

I. THE BIOLOGICAL ROLE

What the family contributes to human personality¹ is difficult to state because the family's contribution to personality is both indirect and direct; that is, biological as well as social. The family gives an individual his hereditary qualities and even if he loses his parents at birth and is reared by others, his personality is in some ways influenced by the peculiar endowment he received from his forbears. This biological contribution of the family to personality is largely indirect (although the hereditary endowment is handed down directly from parents to offspring), because the hereditary factors do not by themselves give us our personality traits. These depend directly on our experiences, and particularly those of the early years of life centering in the family.

The family's biological contribution to personality can be touched on only briefly in this article. The contribution is instantaneous and final, for once the egg has been fertilized, it contains all the hereditary factors it ever will have, even though in some cases it may take years for the structures to mature, as in the case of sex. The fertilized egg contains 48 chromosomes, half of which are received from each parent. The child obtains his biological inheritance from his parents, but they obtained theirs from their parents, and so on back. The child is therefore indebted not alone to his parents but to all his ancestors for his particular inheritance. In any individual case it is not possible to estimate exactly how much of a child's inheritance can be attributed to his immediate family, but on the average Galton's "Law of ancestral inheritance" has been found to hold. The child's parents contribute between them one-half of each inherited trait, the four grandparents supply all together one-quarter of each characteristic, the eight great grandparents one-eighth, and so on, the various fractions—one-half plus one-fourth plus one-sixteenth—finally totalling one, or the sum of the child's inheritance.²

Biological versus social heredity. The initial cell or fertilized egg is multiplied countless times by division and subdivision, producing ultimately the completely developed individual. As the cells multiply, they become specialized

as to function, such as the building of muscle, bone or skin. But some of the cells remain segregated, namely the germ cells which are later available to continue the life cycle. These germ cells are replicas of the parent germ cells and remain unaffected by the ordinary experience of the individual and by changes in his body cells. It is for this reason that a man who loses his arm or leg in an accident may nevertheless become the father of a fully-limbed child. Similarly, if impairments of the body during lifetime are not transmitted through the germ plasm, drunkenness in the parents cannot possibly affect the child's heredity, although it may affect his development in embryo if the drinking is done by the mother to the point where it affects her health or nutrition. And, of course, the environment of heavy drinking will not be without its effect on the child after he is born. But the point to be stressed here is that the germ cells, or carriers of heredity, are isolated from the rest, which is nature's way of preserving them from harm. If impairments of the body during lifetime are not directly transmissible via heredity, neither are improvements in the parents in body or mind, due to good diet, proper exercise or learning. The parents may both be Ph.D.'s but the mental endowment which their children receive from their heredity would be exactly the same if neither parent had had a single day of schooling. However, the children would of course benefit after birth through association with their highly educated parents. The inviolability of the germ plasm means that the advantage gained by one generation through education and learning must be transmitted to the next generation via the learning process if it is to be retained. There is no gain in literacy, in morality, or in any other virtue which must not be won anew in every generation through education. This point is highly important, for it shows that there are two mechanisms of transmission, the one biological via the germ plasm, the other social via learning. These processes are very different, even if related, and much harm can result from the failure to distinguish between them.

A corollary of the point just made is that we inherit structures of various kinds but not functions. When we say that the genes are the determiners of heredity we mean they determine the structures. For instance, the apparatus of speech is inherited, the voice box, the pharynx,

the larynx, the vocal cords, the nervous mechanism involved, and all the rest, so that we say the capacity to make sounds is inherited. But what use we make of this inherited mechanism whether it is to speak English, or French, or Chinese, is learned. The vocal apparatus of a deaf mute may be perfect yet he cannot speak because he has never heard language spoken.

II. THE SOCIAL ROLE

During the uterine period, the child is influenced by only one person, his mother, and her influence is wholly physiological. The cutting of the umbilical cord does not end this dependence upon the mother if she nurses her child, but at birth a new type of experience begins, namely social psychological experience, or intercommunication with other human beings. If the child's mother happens to be a highly undernourished and nervous person, the child will probably be born with a poor structure, say with deficient calcium for bones and teeth, but the mother's nervous condition will not directly have had any influence upon the child, since there are no nerves linking the mother and the embryo. After birth the situation changes radically. Now the nervous mother comes into direct contact with her baby and the baby at once feels the effects of the mother's nervousness, in everything that the mother does, especially in the feeding experience. A nervous mother is more likely to find the feeding experience painful or irksome than a mother who is not nervous. For the child of a nervous mother the feeding periods are apt to be shorter, more abrupt, less satisfying. In other ways the nervous mother overstimulates her baby: in handling, in bathing it, in dressing it, in fondling it, in talking to it. Later such a mother may speak sharply to the child, frequently lose her temper, easily be annoyed by the child's actions, constantly reprimand the child for trifling misconduct, show chronic anxiety for the child's welfare, and so on. For the child there is no escape from these stimuli, as there was before birth. If an invisible statistician could follow the child about, day after day, making a record of these stimulations by the mother, the total number recorded would be very impressive and would make it easy for us to see why a child so stimulated becomes hyper-sensitive.

Birth, then, is the signal that starts the learn-

ing process going. Children may do some learning before birth but the amount is probably insignificant because of the restricted nature of the stimuli in the environment of the womb. After birth the world that opens up to the child is very different. It is rich in stimuli and they are highly diversified. There are people to respond to: mother, father, sisters, brothers, relatives, friends, neighbors, strangers. Also there are things, almost too numerous to mention: diapers, safety pins, soap, talcum powder, olive oil, shoes and socks, shoe-laces, dresses, crib, sheets, blanket, rattle, hot water bottle, teddy bear, dolls, beads, blocks, songs, words, pictures, and so on. The child learns to recognize and use these tools. He also learns various practices, customs and traditions, like being fed and bathed at regular intervals, playing games like peek-a-boo, celebrating birthdays, saying prayers, listening to lullabies and bed-time stories. They are only a part of the vast social heritage that has been these tens of thousands of years in the making, with which the child will become progressively familiar as he grows older, and which will shape his personality.

The influences of group and culture. The environment that begins to shape the child's personality at birth consists, then, of other people and of culture. The two are inextricably intertwined, for the cultural heritage reaches the child largely through the medium of other persons, despite the fact that culture is increasingly stored in objective forms, like books, libraries and museums. Likewise the persons who influence the child are themselves in large part the product of cultural influences. Whether parents are companionable with their children or not, whether they are loving and friendly, may depend on the way the culture defines the role of the parent. In most places the mother is closer to the little child than is the father, a condition which may have its roots in the greater physical dependence of the infant upon its mother, yet there are cultures, like that of the Manus of New Guinea,³ where the father has a closer relationship with the children, because the culture so rules, while in still other cultures⁴ neither parent is companionable with the children, and the children have much the same feeling for their parents as they do for other adults in the community. The type of relationship of parents and children is fairly general in a society and is established by the

culture. In the United States we have no homogeneous culture and no single pattern of parent-child relationship is as conspicuous as it is, say, among the Manus people, although there is a fairly general feeling that mothers ought to look after their children, especially when they are little. Other patterns are permitted, however, in different groups, such as the assignment of children to governesses by the rich and placement of little children in day nurseries and nursery schools by working mothers. The culture, then, dictates more or less what the relationship of mother and child shall be, especially during the child's infancy. But the relationship between mother and child is not wholly determined by these traditional factors. Other factors, of a more personal and local character, also play their part in affecting the relationship. Such factors are, for instance, whether or not the child is planned for and wanted, whether the parents desire a boy or a girl, how much discomfort the pregnancy causes the mother, the health or sickness of the infant, and so on. These are considerations which are personal and which concern chiefly the individuals involved, hence may be referred to as group or social factors, in contradiction to the more general cultural factors. It may be argued by some that the considerations just mentioned are not personal but really cultural in origin; that for instance, the preference of parents for a male child in our society flows from the fact that in our culture males have more privileges than females, and it is perhaps easier to rear a boy than a girl. If the preference for male births is cultural, how then shall we account for expectant parents who hope greatly that their baby will be a girl? The answer may be found in the personal experience of the parents, but hardly in the prevailing culture patterns. So it is with much of our interaction with others. The type of relationship we develop depends in part on special, personal factors as well as on the more general, traditional pressures of the culture, although in practice it is exceedingly difficult to distinguish between the two.

Special importance of the early years. One of the great discoveries made by the psychoanalysts has to do with the special significance of the early years of life for personality. Previously it had been thought that not much of any consequence happened during the first five or six years. The very early experiences are

hard to recall, especially those of the first two or three years, from which it was assumed that the experiences could not be of much importance. The over-emphasis on heredity, which is not so great now as before but still great, obscured the importance of early experiences. For these reasons and others the average person glosses over his childhood experiences as if they counted for little, and if he is writing his autobiography, dwells largely on the achievements of adulthood. It is much nearer the truth to say that the earlier experiences are the more important for they set the direction in which the person is to go. As the twig is bent, so is the tree inclined. The early experiences are important because they come first and build up mental sets that condition all later learning.

How the very early influences leave their mark may be illustrated by the case of a college senior who despite notable achievements in many fields labored under a feeling of acute inferiority. He was editor of the college daily, president of his class, a member of the golf team, a leader in his fraternity, yet confided to friends that he felt he deserved none of these honors except the golf but they came to him only because others were mistaken in their judgment of him. If they really knew him, they would not choose him, and he felt that the revelation might come to them at any moment. "I'm really dumb" he would tell his close friends. Since there was nothing in his present situation to explain such an attitude, an inquiry was made into his past experiences and disclosed that when he was a little child he was discriminated against by his father, who preferred a more brilliant brother who was somewhat older. Very early he acquired the idea of inferiority, especially intellectual inferiority. This led him to develop along social and athletic lines, to the point where he had a remarkable facility for getting along with people and was a fair athlete. But the sense of inferiority that took root early in life was still with him, robbing him of genuine satisfaction in his achievements. This sense of inadequacy had been repressed because it was painful to contemplate, but it lingered in his subconscious and colored his estimate of himself.

When we say that the fundamental patterns of personality are laid down during the early years of life, we do not mean that nothing may later be done to modify these patterns, although

as a rule patterns once established tend to persist because it is easier to do nothing about them. The tenacity of these first patterns is very great, even when they are undesirable and do not help the individual to make satisfactory adjustments or produce happiness. Thus the persistence of self-seeking tendencies when laid down early is impressive. If a child, by virtue of real or imagined handicaps feels greatly inferior to other children and aggressively attempts to dominate others in school work, in play and in activities generally, he will in all probability grow up into an adult who seeks power over others. Sometimes the personality pattern is disguised but if one looks below the surface it can be seen to exist. At first the power-seeking impulses may lead a person to anti-social activities, as in crime. Later the person may be reformed. He is induced to give up criminal activities and take up pursuits that are approved by the group. He may become a detective and aid the forces of law and order. But it is important in these cases not to regard the change in social behavior as necessarily indicating a fundamental change in personality. The reformed criminal, now a detective, may be just as ambitious, just as self-seeking, just as anxious to establish himself over others, as he was before. The form of the drive has changed, not the drive itself. It is highly important for students of personality to distinguish between personality traits and social roles. It is possible, of course, to change some personality traits, although this is much more difficult.

Special role of family experience. If the early years of life are of special importance for personality development, it follows that the family occupies a commanding position in the field, since the child's earliest and most telling experiences are with his family.⁵ The child at birth is an exceedingly helpless individual, entirely at the mercy of others for protection, if not for survival. The small helpless child is protected by his family and from them usually gets a sense of security in life. This he gets through the furnishing of food and clothing and shelter by the parents, but even more by the parental expressions of affection and approval. Some psychiatrists, like Karen Horney, believe that the common denominator in neuroticism is a lack of genuine affection in early childhood.⁶ Criminologists likewise believe that the roots of delinquency are to be sought in the

emotional rejection of children by their parents. Healy and Bronner⁷ studied many pairs of twins, where only one of the pair was delinquent. Why, it was asked, did the one become delinquent and the other not? Analysis of the cases according to these investigators showed that in every instance the delinquent had suffered serious frustration in his family experience, whereas the non-delinquent brothers and sisters had not. These studies make out a strong case for the strategic role of early family experience in the formation of personality.

Ideas, especially moral ideas, play an important part in personality, and the influence of the family in developing such ideas in children is great, very much greater in fact than the influence of the school and the church combined. This observation is indicated by a report⁸ of the sources from which children derive their ethical concepts. A large number of children were tested as to their ideas of right and wrong, and the results correlated with the scores of the children's associates, as follows:

Child and his parents .....	.545
Child and his friends .....	.353
Child and his club leaders .....	.137
Child and his day-school teachers ...	.028
Child and his Sunday-school teachers	.002

The figures show that there is no agreement of any importance between the moral judgments of these children and those of their club leaders, school teachers or Sunday-school teachers, indicating that these persons did not influence the child's moral thinking in a positive way, at least insofar as the ideas tested were concerned. The connection between the ideas of right and wrong of the children and those of their chums is more significant but we have no way of telling whether the children got their ideas from their chums or selected out as chums those who happened to agree with them. In the case of parents, however, there can be no question of the casual relationships, since children do not choose their parents or parents their children. As would be expected, the mothers' concepts were more closely allied to the children's than were the fathers', reflecting the more intimate relationship usually enjoyed by the mother.

Divergent experiences of children in the same family. Although family experiences, especially those of the early years, are of primary impor-

tance for personality, this does not mean that the experiences are the same for all the children. One reason, already mentioned, is the differential treatment which children in the same family receive from their parents, which may be so great as to produce an emotional disturbance in the child who is not favored. This is brought out vividly in a comparison of non-identical twin brothers, six years old, one of whom was a delinquent.⁹ The latter had twice run away from home; had been picked up by the police several times; had made a serious attempt to set the house on fire; was truant from school; had repeatedly stolen considerable amounts from his teachers and parents, as well, as from a neighbor's apartment, a hospital, and a gasoline station. His parents complained of his disobedience, impudence, and temper tantrums. The non-delinquent brother, on the other hand, was described as an even tempered, obedient, thoroughly well behaved, "model child." Health was apparently not a distinguishing factor, since the physical condition of the twins was good and about equal. A difference in intelligence was noted, as measured by I.Q. tests. The non-delinquent scored 95, the delinquent 82, but it was felt that the latter would have done considerably better if his attention could have been held. The family lived in crowded quarters, but was under no great financial stress. However, the parents were incompatible and quarreled often, the mother charging the high-tempered father with whipping too severely, and he accusing her of being dull, incompetent and too lenient. The outstanding factor noted by the investigators was the attitude of the father toward the delinquent. He said he detested the boy and had ever since he was two months old, and gave as his reason that the infant had shown a stubborn lack of response to him. "I can't bear to have him touch me," said the father. "I would rather have a snake around me than have him." From the mother it was learned that the father always repulsed the boy when he attempted to climb on his knee, whereas the other twin was welcomed. The delinquent boy testified that he deeply felt the deprivation of his father's love, as well as other forms of discrimination, and the investigators interpret the boy's delinquencies as attempts to escape from unpleasant situations, to obtain revenge, and to get substitutive satisfactions.

It will be noted in this account that the father

referred to a "stubborn lack of response" which the delinquent showed toward him even as an infant, and it is possible that some inherited or constitutional factor may be involved here. On the other hand, this is the report of a man who shows a violent dislike of his son, and he may be referring to the effect rather than the cause, which may have been his own marked partiality for the other twin. Why a parent sometimes prefers one child above another is not entirely clear, but differences in intelligence, competence and general attractiveness of the children may be factors.¹⁰

While there is no gainsaying the fact that influences besides those originating in the family affect personality, it is important to note that children brought up in the same family never have identical experiences. Children who belong to the same family have the same parents and occupy the same home, but this is not entirely true from a psychological standpoint. When the first child is born he has a clear field but when a second child arrives, a problem of filial adjustment is created. For instance, if the older child has begun to take piano lessons, the younger one is likely to study some other instrument, because most parents prefer to have some variety in the musical activity of the home. The first child is probably less likely to have to wear "handed-down" clothes than is the younger one. On the other hand, the younger one may enjoy certain advantages. He probably stands a better chance of going to college because the family has more time to accumulate savings and the older child may help with expenses. Some doctors call the first-born the "tension child" because the parents are inexperienced and over-anxious, and parents learn not to repeat certain mistakes with their second child. These influences are, of course, highly variable, and the examples given are cited not so much to show infallible sequences as to indicate the inescapable differences in learning that exist in the family circle.

The way in which an older child influences a younger one is strikingly brought out in the following account of two daughters of the Jones family, Nellie and Mary.¹¹ As soon as Nellie, the first-born, was old enough to learn she was given instruction in needlework and baking by her mother, whose skill in these fields had won blue ribbons at county fairs. Nellie proved to be an apt pupil, and her

needlework and culinary efforts were placed before women of the neighborhood, before friends and relatives, and highly praised. When her mother entertained her club, Nellie would join the women and sew and her handiwork would be passed around and admired. By the time Mary could toddle, Nellie was seven years old. Mary too tried to excel in baking and sewing. On bake day she was given a chance to make little cakes and she learned to make dresses for her dolls. Her work was as good as Nellie's had been at the same age, but naturally it suffered by comparison with Nellie's present handiwork. One day Mary brought out a little blue dress she had made for her doll and showed it to her maternal aunt, who examined it and observed: "Well, Mary, I am afraid you will never be able to sew like Nellie. You are like me. I could never learn to sew." Mary's father, noting her disappointment, tried to console her: "What if you can't sew and bake, you can be daddy's outdoor girl and help him. How would you like a horse to ride?" Mary put her doll aside and seldom played with it again. She followed her father about the farm and rebelled when her mother asked her to do housework. As her father had suggested, she took to riding and by the time she was 10, she took prizes for riding at the county fair. Each day she added some new accomplishment in the out-of-doors and became known as a tom-boy. She excelled her brother at target practice with a 22 rifle. Now she was daddy's outdoor girl, the champion shot of the Jones family, not just Nellie's younger sister.¹²

The only child. Brothers and sisters exert telling effects upon one another's personality which are different from the effects exerted by their parents. From both types of relationship, children gain perspective on themselves and training in social adjustment, but in dealing with their parents they learn response to authority, while in dealing with one another they learn to compete with equals. This puts us in position to see why, unless some rectifying influences are exerted, the only child develops certain handicaps of social and emotional adjustment. A number of studies show the greater difficulty of only children in achieving satisfactory adjustments in marriage, and there is supposed to be relatively more neurotism and unhappiness among such children. There is some evidence to suggest that they are more

often successful in the economic struggle than their numbers would warrant, probably because they have the advantage of better training, since they do not have to share the available family funds with brothers and sisters. However, the evidence on the position of the only child is not conclusive and a recent comprehensive review of the literature reports that in most traits only slight differences are indicated between children that have siblings and those that do not.¹³ It is possible therefore that the dangers of being an only child have been overdrawn. Perhaps the unusual popular stress laid on this problem has made parents more mindful of the dangers and has led them to take appropriate precautions. Also, the increase in the number of families with but a single child means that the situation is much less uncommon than it used to be, and that therefore only children are probably less sensitive about their status, which would be a favorable factor in adjustment.

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NOTES

* This discussion is adapted from the writer's forthcoming *Marriage and the Family*, Houghton Mifflin, Boston.

¹ By personality we mean the pattern of a person's thoughts, feelings and actions, that is, his psychological behavior as distinguished from his physiological behavior, although many interconnections exist between these two fields. Habits, opinions and attitudes constitute the core of personality.

² E. G. Conklin, *Heredity and Environment*, Princeton, Princeton University Press, 1922, p. 77.

³ Margaret Mead, *Growing Up in New Guinea*, New York, Morrow, 1930. An even more striking case is furnished by Marquesan culture, where the women subordinate the parental functions to the sexual and marital functions, giving little attention to their children. Abram Kardiner, *The Individual and His Society*, New York, Columbia University Press, 1939, Ch. V.

⁴ Edward Tregear, *The Maori Race*, Wanganui, 1905.

⁵ The great variability of family situations is indicated in an analysis by James H. S. Bossard and Eleanor S. Boll, *Family Situations: An Introduction to the Study of Child Behavior*, Philadelphia, University of Pennsylvania Press, 1943. This study differentiates 52 types of family situations, each of which is illustrated by a concise case study.

⁶ Karen Horney, *The Neurotic Personality of Our Times*, New York, Norton, 1937.

⁷ William Healy and Augusta F. Bronner, *New Light on Delinquency*, New Haven, Yale University Press, 1936.

⁸ H. Harshorne and M. A. May, "Testing the Knowledge of Right and Wrong," *Religious Education*, 21, 539-54, October, 1926.

⁹ Case A, Chapter VII, Healy and Bronner, *op. cit.*, pp. 95-98.

¹⁰ Where partiality is shown, usually the parent is conscious of his behavior, but there are a surprising number of cases where the parent is unaware of his partiality. A mother of two daughters, age three and six, sought assistance in correcting undesirable behavior which the older daughter was showing. She was sullen, defiant, and uncooperative. When given a dress for her birthday, she cut it to bits with a pair of scissors. Investigation showed that the mother was slighting the older girl, who resented the discrimination and was resorting to unapproved behavior in order to get attention. When given this explanation, the mother strongly denied its validity and claimed she had equal affection for her two girls. However, it was pointed out that in addressing the older girl the mother simply called her by her given name but in speaking to the younger one the mother used terms of endearment, and the tone of voice was different. The mother also did many little things for the younger daughter which were not done for the older, like taking time to examine and praise things made or work done. When these differences were pointed out to the mother, she acknowledged them with some embarrassment as well as amazement that she had been showing partiality so plainly, yet unwittingly.

¹¹ Adapted from L. G. Brown, "The Development of Diverse Patterns of Behavior Among Children in the Same Family," *The Family*, 9, 35-39, April, 1928. For further treatment of this topic, see B. Weill, *Behavior of Young Children of the Same Family*, Cambridge, Harvard University Press, 1928.

¹² The above account is interesting in showing that, to gain distinction as a person, Mary had to develop interests different from those of her sister. There is another side of the picture which is not given, namely, the effect of Mary's popularity upon Nellie, which is also interesting to speculate upon.

¹³ W. Paul Carter, *The Only Child and Other Birth Orders*, doctoral dissertation, Chicago, University of Chicago Libraries, 1937. Studies in progress suggest that only children at Bucknell University do not differ significantly in emotional, social and health adjustment from a control group of non-only children. The groups were matched for age, sex, education of parents, occupation of parents, and I.Q.

PERSONNEL, TEACHER.—The research in this area has been dominated in the main by the immediate and practical problems of the field worker rather than by the fundamental issues and theoretical considerations of the scientist. Many different sorts of problems have come under investigation such as teacher supply and demand, the education of teachers, the measurement of teaching efficiency, recruitment,

selection, placement, teaching loads and assignments, salaries, tenure, pensions, certification and the status of teachers. Only a few of these many aspects of teacher personnel will be discussed here. The summary here presented will be limited to those aspects of the subject that seems most akin to subjects ordinarily considered by students of psychology, such as, the definition and measurement of teaching efficiency, factors conditioning efficiency, the education of teachers, and the prediction of teaching efficiency. For information relative to the professional and administrative aspects of this subject the reader is referred to the *Encyclopedia of Educational Research* by Monroe and others (21). The first subject to be discussed is that of the definition and measurement of teaching efficiency.

THE DEFINITION AND MEASUREMENT OF TEACHING EFFICIENCY

Definition of Teaching and Teaching Efficiency. The scope of the teacher's responsibilities have never been very clearly defined. In a sense every book, magazine or monograph that relates to teaching makes certain assumptions about the teacher's responsibilities and the prerequisites to teaching success. Nowhere, however, have these many definitions been collocated into a simple statement. One of the most comprehensive studies of practice was made some years ago by Charters and Waples (13). They attempted to define the scope of teaching by listing the activities performed by teachers in the discharge of their every day responsibilities. They listed the following major groups of activities: (1) activities involved in classroom instruction; (2) activities involved in school and classroom management; (3) activities involving supervision of pupils' extra-classroom activities; (4) activities involving relationships with the personnel of the school staff; (5) activities involving relations with members of school community; (6) activities concerned with professional and personal advancement; and (7) activities concerning school plant and supplies. They also attempted to list the personal and professional requirements for successful performance of these activities. While opinion relative to matters of this sort shift from time to time there seems to be a tendency at present, in keeping with the Charters-Waples study, to define the teacher's task to include not merely

TABLE I

Frequency of Personal and Related Reasons for the Dismissal of Administrators and Teachers in Smaller Secondary Schools

Reasons (in Rank Order)	Adminis- trators	Number of Staff Members		All
		Teachers		
		Men	Women	
Weakness in discipline	23	32	50	105
Lack of cooperation	1	7	21	29
Lack of personality	1	4	13	18
Immorality	2	7	5	14
Lack of adaptation	5	5	4	14
Too much attention to the opposite sex	1	4	9	14
Untactful	3	6	5	13
In difficulty with employers	4	3	5	12
Unpopular with pupils	2	5	4	11
Failure to pay financial obligations	5	5	.	10
Insubordination	2	2	4	8
Talked too much .....	.	2	6	8
Didn't work at job	1	2	3	6
In difficulty with principal .....	.	1	5	6
Lack of social adjustment in community	2	3	1	6
Embezzlement	2	3	.	5
"Poor" organizer and administrator	5	.	.	5
Careless	1	.	2	3
Disturbing element—wanted to run school .....	.	2	1	3
Family difficulties	2	.	1	3
Lack of initiative	1	.	2	3
Old-fashioned	1	.	2	3
Too dictatorial	1	.	2	3
Unpopularity of department .....	.	3	.	3
Coach—poor morale .....	.	2	.	2
Conduct unbecoming a teacher	1	.	1	2
Deterioration	1	.	1	2
Lack of poise (nervousness) .....	.	.	2	2
Poor attitude .....	.	1	1	2
Too many outside activities	2	.	.	2
An "out-and-out" fool .....	.	1	.	.
A radical politically	1	.	.	.
Coach—too hot-headed .....	.	1	.	.
Didn't fit in with better element .....	.	.	1	.
High tempered .....	.	.	.	.
Lack of progress	1	.	.	.
Low standards of pupil achievement	1	.	.	.
Man teacher—partial to girls with grades .....	.	1	.	.
No ambition—plenty of ability, but would not work	1	.	.	.
Raised too much "hell" in school system .....	.	.	1	.
Religious fanatic .....	.	.	1	.
Ruled by wife	1	.	.	.
Thought he was too big for his job	1	.	.	.
Too boisterous in attitude .....	.	1	.	.
Unsatisfactory as principal	1	.	.	.
Total number of dismissals: for all reasons	365	554	850	1769

Of the 1,769 reasons for dismissal of teachers and administrators, 332, or 18.8% were for personal deficiencies. Of these 40.7% were for lack of leadership; 21.4% for lack of refinement; 18.4% for lack of cooperation; 10.2% for lack of adaptability; 4.8% for lack of industry; and 4.5% for lack of honesty.

the direction of learning (curricular and extra-curricular), but many other activities as well. Other data defining the scope of the teacher's responsibilities and setting forth the conditions for efficiency will be found in studies of the reasons for failure in teaching, studies of the difficulties of teachers, studies of the likes and dislikes of pupils, studies of the characteristic differences in the teaching performance of good and poor teachers and the many measurements studies to be reported later. Only a few of the studies can be referred to here. Those that are cited have been chosen to illustrate the type of work that has been undertaken in this area. They should also add concreteness to the discussion to follow.

Simon's Study of Reasons for the Dismissal of Teachers from Small School Systems. Simon (26) obtained by interview with 87 county and 81 town superintendents of Indiana, the causes of teacher withdrawals from small school systems for the years 1927 to 1933. Weakness in discipline was the most frequently mentioned cause (Table I). Other frequently mentioned

causes were lack of cooperation, lack of personality; too much attention to the opposite sex, and immorality; lack of adaptability; tactlessness and unpopularity with pupils.

Hill's Summary of Studies in the Difficulties of Teachers. There have been many studies made of the difficulties of teachers. Hill (19) has brought together in one analysis 47 of these studies involving some 12,372 teachers. The difficulties most frequently mentioned in these studies were: providing for individual differences, teaching methods, discipline, motivation, direction of study, classroom management, selecting subject matter, organizing the materials of instruction, planning assignments, grading, testing and the like.

Hart's Study of the Opinions of Pupils. One of the most elaborate studies of the opinions of pupils was made by Hart (18). Questionnaires were sent to the seniors of sixty-six high schools in widely distributed sections of the country asking them to list the reasons for liking their one best teacher most and for liking least their one most disliked teacher. Some ten thousand

TABLE II

Most Frequently Mentioned Instructional Difficulties of Teachers
(An analysis of 47 studies of some 12,372 teachers)

1. Difficulties in providing for individual differences among pupils	19*
2. Difficulties in teaching method	18
3. Difficulties of discipline control, social development of the pupil	17
4. Difficulties of motivation, getting children interested, getting them to work	12
5. Difficulties in the direction of study	9
6. Difficulties in organizing and administering the classroom	8
7. Difficulties in selecting appropriate subject matter	6
8. Lack of time during the school day for all the things that need to be done	6
9. Difficulties in organization of materials	6
10. Difficulties in planning and making assignments	5
11. Difficulties in grading and promotion of pupils	5
12. Inadequacy of supplies and materials	4
13. Difficulties in testing and evaluating	4
14. Personal difficulties of the teacher	4
15. Difficulties arising from conditions of work	3
16. Difficulties involved in diagnosing and correcting particular pupil difficulties	3
17. Difficulties in teaching reading	3
18. Difficulties in making plans for teaching	3
19. Difficulties in promoting desirable habits	2
20. Difficulties in securing study aids	2
21. Difficulty in securing pupil participation	2
22. Difficulty because pupils talk while others are reciting	2
23. Outside interruptions of class work	2
24. Miscellaneous problems mentioned in only one study	4†

* Number of studies in which difficulty was among the first six.

† These were mostly specific problems. Seven were difficulties in teaching this or that subject. Others were rural school problems such as "only one pupil in grade," or "too many grades in one room."

usable replies were received. The qualities of merit in the teachers they liked most (Table III) were: helpful with school work, good natured, friendly, interested in pupils, makes work interesting, has good control, impartial, not crabby, pupils learn subject, good personality and many other similar matters. Among the

reasons most frequently mentioned for the least liked teachers were: crabby, not helpful with school work, has "pets," is aloof, unreasonable, unfair, inconsiderate, has poor control, and lacks interest in work.

Barr's Study of the Teaching Performance of Good and Poor Teachers. Another source of

TABLE III

Reasons for Liking "Teacher A" Best, Arranged in Order of Frequency of Mention,
As Reported by 3,725 High School Seniors

Reasons for Liking "Teacher A" Best	Frequency of Mention	Rank
Is helpful with school work, explains lessons and assignments clearly, and uses examples in teaching	1950	1
Cheerful, happy, good-natured, jolly, has a sense of humor, and can take a joke ..	1429	2
Human, friendly, companionable, "one of us"	1024	3
Interested in and understands pupils	937	4
Makes work interesting, creates a desire to work, makes class work a pleasure....	805	5
Strict, has control of the class, commands respect	753	6
Impartial, shows no favoritism, has no "pets"	695	7
Not cross, crabby, grouchy, nagging, or sarcastic	613	8
"We learned the subject"	538	9
A pleasing personality	504	10
Patient, kindly, sympathetic	485	11
Fair in marking and grading, fair in giving examinations and tests	475	12
Fair and square in dealing with pupils, has good discipline	316	13
Requires that work be done properly and promptly, makes you work	364	14
Considerate of pupils' feelings in the presence of the class, courteous, makes you feel at ease	362	15
Knows the subject and knows how to put it over	357	16
Respects pupils' opinions, invites discussion in class	267	17
Not superior, aloof, "high hat," does not pretend to know everything	216	18
Is reasonable, not too strict or "hard-boiled"	199	19
Assignments reasonable	191	20.5
Helpful with students' personal problems, including matters outside of class work..	191	20.5
Dresses attractively, appropriately, neatly, and in good taste	146	22
Young	121	23
Work well planned, knows what class is to do	110	24
Enthusiastically interested in teaching	108	25
Gives students a fair chance to make up work	97	26
Home-work assignments reasonable	96	27
Recognizes individual differences in ability	86	28
Frank, "straight from the shoulder," a straight shooter	78	29.5
Personally attractive, good-looking	78	29.5
Teaches more than the subject	74	31
Interested in school activities	68	32
Sticks to the subject	52	34
Modern	52	34
Sweet and gentle	50	35.5
Pleasing voice	50	35.5
Intelligent	42	37
Prompt and business like	41	38
Sincere	36	39
Knows more than the subject	32	40
Has pep	31	41
Uses good judgment	22	42
Cultured and refined	20	43

TABLE IV

Reasons for Liking "Teacher Z" Least, Arranged in Order of Frequency of Mention,
As Reported by 3,725 High School Seniors

Reasons for Liking "Teacher Z" Least	Frequency of Mention	Rank
Too cross, crabby, grouchy, never smiles, nagging, sarcastic, loses temper, "flies off the handle"	1708	1
Not helpful with school work, does not explain lessons and assignments, not clear, work not planned	1025	2
Partial, has "pets" or favored students, and "picks on certain pupils"	859	3
Superior, aloof, haughty, "snooty," overbearing, does not know you out of class... ..	775	4
Mean, unreasonable, "hard boiled," intolerant, ill mannered, too strict, makes life miserable	652	5
Unfair in marking and grading, unfair in tests and examinations	614	6
Inconsiderate of pupils' feelings, bawls out pupils in the presence of classmates, pupils are afraid and ill at ease and dread class	551	7
Not interested in pupils and does not understand them	442	8
Unreasonable assignments and home work	350	9
Too loose in discipline, no control of class, does not command respect	313	10
Does not stick to the subject, brings in too many irrelevant personal matters, talks too much	301	11
"We did not learn what we were supposed to"	275	12
Dull, stupid, and uninteresting	275	13
Too old-fashioned, too old to be teaching	224	14
Not "Fair and square" in dealing with pupils	203	15
Knows the subject but "can't put it over"	193	16
Does not hold to standards, is careless and slipshod in her work	190	17
Too exacting, too hard, gives no chance to make up work	183	18
Does not know the subject	170	19
Does not respect pupils' judgments or opinions	133	20
Too changeable, inconsistent, unreliable	122	21
Lazy, not interested in teaching	115	22
Not friendly, not companionable	98	23
Shows boy or girl favoritism	95	24
Dresses unattractively or in bad taste	92	25
Weak personality	85	26
Insincere	75	27
Personally unattractive	65	28
Does not recognize individual differences in pupils	64	29
Voice not pleasant	63	30

ideas on the scope of the teacher's responsibility and the conditions for efficiency will be found in the studies of the teaching performance of good and poor teachers. Barr's (4) study of the Characteristic Differences in the teaching performance of good and poor teachers of the social studies has been chosen as illustrative of the studies of this sort. To get information on this subject Barr made intensive studies of the teaching performance of forty-seven good and forty-seven poor teachers of the social studies through the use of detailed check lists, time-chart records, stenographic reports, and repeated observations. Lists of the characteristics most frequently associated with good and poor teachers are given below:

CHARACTERISTICS MOST FREQUENTLY ASSOCIATED WITH GOOD TEACHERS

1. Ability to stimulate interest
2. Wealth of commentarial statements
3. Attention to pupils while reciting
4. An effective organization of subject matter
5. Well-developed assignments
6. Use of illustrative materials
7. Provision for individual differences
8. Effective methods of appraising the work of pupils
9. Freedom from disciplinary difficulties
10. Knowledge of subject matter
11. Knowledge of the objectives of education
12. Conversational manner in teaching

13. Frequent use of the experiences of pupils
14. An appreciative attitude, evidenced by the teacher's nods, comments, and smiles
15. Skill in asking questions
16. Definite directions for study
17. Skill in measuring results
18. Willingness to experiment

SOME ELEMENTS OF WEAKNESS FOUND IN THE TEACHING OF POOR TEACHERS

1. Inadequate provision for individual differences
2. Inadequate socialization
3. Formal textbook teaching
4. Inability to stimulate interest
5. Weak discipline.
6. Inadequate daily preparation
7. Lack of interest in work
8. Inadequate knowledge of subject matter

OTHER LESS FREQUENTLY MENTIONED ELEMENTS OF WEAKNESS FOUND IN THE TEACHING OF POOR TEACHERS

1. No systematic method of checking work
2. Dictatorial, aroused antagonism
3. Drills uninteresting
4. English (not good)
5. Enunciation poor
6. Expected too much of pupils
7. Failed to get results
8. Failed to gain respect of pupils
9. Favoritism toward individual members of class
10. Giggles (peculiar mannerism)
11. Overuse of group response
12. Interpretation (poor, verbose, not easily understood)
13. Indifferent to criticism
14. Lacked ability to organize work
15. Lacked human contacts
16. Lacked knowledge of details
17. Lacked tact in handling disciplinary situations
18. Laughed at pupils' mistakes
19. Loafed
20. Made too much of pupil-response
21. Pupil mistakes and errors not corrected
22. Modest to point of shyness
23. Nagged pupils
24. Nervous (coughed frequently)
25. No understanding of pupils
26. Overemphasized details
27. Too much notebook work

28. Too anxious to please
29. Teacher completely eliminated herself (read morning paper while class recited)
30. Poor relations between pupils and teacher.
31. No use made of pupil experience
32. Pupils didn't know, just plain guessing
33. Pupils not held to careful statements
34. Lacked control over technique of questioning
35. Talked too fast
36. Talked down to pupils
37. Did not talk loud enough
38. Teacher limp, passive, and embarrassed
39. Teacher resorted to bluffing
40. Teacher too friendly with boys
41. Teacher too friendly with girls
42. Teacher's relation with older boys not good
43. Teacher and community not cooperating
44. Unstable in likes and dislikes of pupils
45. Verbose and abstract
46. Walked rapidly up and down
47. Would not take suggestions
48. Wasted time

An Analysis of Teacher Rating Scales. Barr and Emans (10) made an analysis of 209 rating scales to determine those qualities most uniformly expected of teachers by various rating officials. Among the things most frequently mentioned in the teacher rating scales here studied were classroom management, instructional skill, personal fitness and results. A summary of their analysis is given in Table V. A comparison of the data secured relative to the personal prerequisites to teaching efficiency with that of the Charter-Waples study is presented in Table VI.

THE MEASUREMENT OF TEACHING EFFICIENCY

Four approaches have been made to the measurement of teaching efficiency:

- (1) the measurement of traits or qualities of the person thought to be associated with efficiency.
- (2) the measurement of the mental prerequisites to teaching efficiency: knowledges, skills, attitudes, ideals and the like.
- (3) the evaluation of performance.
- (4) the measurement of pupil changes attributed to teaching.

Each of these approaches has its advantages and disadvantages and serves a different purpose. Before going into this matter it would seem

TABLE V

A Typical Scale for the Rating of Teachers *

	Frequency
I. Classroom Management (general) (2, 107, 116, 168)	205
1. Attention to physical conditions	
(a) Heat (45, 167, 171)	48
(b) Light (46, 160, 175)	49
(c) Ventilation (42, 145, 150)	58
2. Housekeeping and appearance of room (7, 97, 119, 148, 152)	173
3. Discipline (6, 137, 138, 179, 184, 188)	160
4. Economy of time (50)	34
5. Records and reports (43, 70)	67
6. Attention to routine matters (31, 162, 173, 197)	72
II. Instruction Skill (general) (1, 47, 89, 118, 133, 143, 157, 198)	371
1. Selection and organization of subject matter (4, 87, 165)	177
2. Definiteness of aim (15, 109, 161)	110
3. Skill in assignment (14, 127, 128, 174)	118
4. Attention to individual needs (26, 182)	70
5. Skill in motivating work (27, 131)	78
6. Attention to routine matters (31, 162, 183, 197)	72
7. Skill in directing study (30, 199)	65
8. Skill in stimulating thought (40)	35
9. Daily preparation (lesson planning) (21, 52, 154, 192)	116
10. Skill in presenting subject matter (60, 87)	54
11. Pupil interest and attention (91)	22
12. Pupil participation (56, 176)	38
13. Attitude of pupils (75, 76, 181)	56
14. Results (in one form or another) (22, 29, 41, 51, 83, 111, 126, 140, 147, 153, 159, 166, 191)	305
III. Personal Fitness for Teaching (general) (5, 18, 33, 88, 117, 125, 129, 142, 149, 189) ..	369
1. Accuracy (carefulness, definiteness, thoroughness) (54, 180)	37
2. Adaptability (48, 65)	64
3. Attitude toward criticism (67)	28
4. Considerateness (appreciativeness, courtesy, kindness, sympathy, tactfulness, unselfishness) (16, 73, 80, 122)	145
5. Energy and vitality (53, 135, 144)	55
6. Enthusiasm (alertness, animation, inspiration, spontaneity) (23)	67
7. Fairness (sense of justice) (77, 82)	49
8. Forcefulness (courage, decisiveness, firmness, independence, purposefulness) (186) ..	5
9. Good judgment (discretion, foresight, insight, intelligence) (63)	30
10. Health (10, 187)	106
11. Honesty (integrity, dependability, reliability) (59, 120)	46
12. Industry (patience, perseverance) (39)	46
13. Leadership (initiative, self-confidence, self-reliance) (17, 57, 96)	131
14. Loyalty	x
15. Morality (92, 101, 123)	56
16. Open mindedness	x
17. Optimism (cheerfulness, pleasantness, sense of humor, wittiness) (86, 112, 124) ..	54
18. Originality (imaginativeness, resourcefulness) (36, 141)	58
19. Personal appearance (8, 64, 84, 85, 106)	213
20. Posture (190)	5
21. Progressiveness (ambition) (121)	15
22. Promptness (dispatch, punctuality) (20, 98, 103)	112
23. Refinement (conventionality, good taste, modesty, simplicity)	x
24. Self-control (calmness, dignity, poise, reserve, sobriety) (28, 95)	83
25. Skill in expression (13, 169)	93
26. Sociability (33)	52

* The numbers in parentheses following each quality or trait refer to numbers of items in the original study. The data are presented in this manner to enable the reader to check the adequacy of the classification employed.

A Typical Scale for the Rating of Teachers

	Frequency
27. Thrift	x
28. Understanding of children (90)	23
29. Voice (pleasing) (11)	96
IV. Scholarship and Professional Preparation (24, 35, 38, 40, 100, 110, 130, 134, 155, 158, 163, 173, 193)	301
V. Effort towards Improvement (32, 62, 139, 195)	98
VI. Interest in Work—pupils, patrons, subjects taught, etc. (37, 69, 72, 94, 102, 113, 172, 185)	172
VII. Ability to Cooperate with Others (9, 55, 58, 74, 93, 132, 146)	235

worthwhile, however, to emphasize the fact that the measurement of teaching efficiency is fundamental to the study of many aspects of teaching. The scientific study of such problems as selection, recruitment, guidance, education, placement, certification, merit salary scales and supervision all rest upon the development of adequate measures of teaching efficiency. Until this is done decisions about many important aspects of the educational program must rest upon personal opinion, estimates, and

guesses. Such opinions based as they are upon varying conceptions of what constitutes good teaching, different conceptions of evidence and different standards of expectancy have been shown to be generally unreliable. (5)

If it is assumed that it is the function of the teacher to promote pupil growth and learning, then only the fourth of the above named approaches to the measurement of teaching efficiency goes directly at the heart of the matter. Measures of the mental prerequisites to teach-

TABLE VI

A Comparison of the Charters and the Barr-Emans Rank of Teachers' Traits

Traits	Ranks (Charters)	Ranks (Barr-Emans)
1. Adaptability	7	13
2. Attractiveness, personal appearance	13	3
3. Breadth of interest (interest in community, interest in profession, interest in pupils)	8	4
4. Carefulness (accuracy, definiteness, thoroughness)	12	18
5. Considerateness (appreciativeness, courtesy, kindliness, sympathy, tact, unselfishness)	5	5
6. Cooperation (helpfulness, loyalty)	11	1
7. Dependability (consistency)	22	19
8. Enthusiasm (alertness, animation, inspiration, spontaneity)	6	12
9. Fluency	24	9
10. Forcefulness (courage, decisiveness, firmness, independence, purposefulness)	12	23
11. Good judgment (discretion, foresight, insight, intelligence)	3	20
12. Health	13	8
13. Honesty	8	22.5
14. Industry (patience, perseverance)	14	17
15. Leadership (initiative, self-confidence)	12	6
16. Magnetism (approachability, cheerfulness, optimism, pleasantness, sense of humor, sociability, pleasing voice, wittiness)	6	2
17. Neatness (cleanliness)	14	21
18. Open-mindedness	20	24.5
19. Originality (imaginativeness, resourcefulness)	14	14
20. Progressiveness (ambition)	22	22.5
21. Promptness (dispatch, punctuality)	19	7
22. Refinement (conventionality, good taste, modesty, morality, simplicity) ..	11	15
23. Scholarship (intellectual curiosity)	17	10
24. Self-control (calmness, dignity, poise, reserve, sobriety)	4	11
25. Thrift	25	24.5

ing success and of the qualities commonly associated with teaching efficiency have value as measures of teaching efficiency only where they have been validated against pupil growth and learning or other acceptable criteria of teaching efficiency. (5) When so validated, measurements of these background abilities supply important data relative to the measurement of teacher growth and in the diagnosis of teacher deficiencies. Measures of performance serve to localize difficulties and, when considered in relation to pupil change, shed light upon the effectiveness of different forms of teacher behavior, but in many instances in studying the psychology of teaching it is necessary to work back from measurable pupil changes to associated teacher activities to the determiners of human behavior.

Evaluation of performance. Contrary to lay opinion acts are not good or bad in and of themselves divorced from purposes, persons, principles, and limiting aspects of the learning-teaching situation (4, 11). Barr (4) has shown that good teaching cannot be differentiated from poor teaching by means of specific teacher activities. Jayne (11) has shown that activities effective under one set of circumstances and for certain purposes may be quite ineffective for other purposes and under other sets of circumstances. Many studies of teaching neglect the *appropriateness* aspect of activities.

Criteria of teaching effectiveness. Three types of criteria have been employed in the validation of measures of teaching efficiency (20): (a) composites of judgments; (b) tests of qualities commonly associated with teaching success; and (c) measures of pupil changes. While the first two sorts of criteria have been frequently employed in the validation of measures of teaching efficiency and ability they are of secondary character and frequently none too well grounded. Gotham (11) has shown that the intercorrelations among these several criteria are not high. Theoretically the most defensible criterion of teaching efficiency should seem to be the measurable changes of pupils under controlled conditions as in experimental research. The application of this criterion has not been easy, however, in practice. (11) It has not been easy: (1) because of the absence of satisfactory measures of pupil growth; (2) because of the difficulties involved in the establishment of adequate controls over factors in pupil growth other than teaching; and (3) because

of the inadequacies of current methods of analysis. Considerable progress has been made in the application of regression techniques in this area (11). Generally the results obtained from research on this subject are no better than the criterion of teaching efficiency employed.

Data gathering devices employed in the study of teachers and teaching. Many different kinds of data gathering devices have been employed in the study of teachers and teaching. Some of the types of devices most frequently employed are: tests, rating scales, check lists, interviews, and questionnaires. Observations may be systematic or incidental, controlled or uncontrolled. Interviews and questionnaires may be standardized or unstandardized. Examples of all of these data gathering devices will be found in the reports to follow.

Studies of the validity and reliability of measures of teaching ability. Many different instruments have been employed in the measurement of teaching efficiency and related abilities (6, 8, 11, 20, 29). Some of these attempt to provide over all evaluations of teaching efficiency, as do some rating scales and some attempt to measure related abilities. Measurements have been attempted of such qualities and mental prerequisites as intelligence, knowledge of subject matter, general cultural background, skill in expression, leadership, teacher pupil relationships, attitudes on social, political and economic issues, attitudes toward teaching and the teaching profession, emotional balance and adjustment, professional judgment, professional information, and teaching aptitude. While considerable progress has been made in the development of tests of one sort or another, particularly for such abilities and mental prerequisites as those enumerated above, chief reliance is still placed in rating scales. Many different kinds of rating scales have been employed such as point scales, quality scales, man to man comparison scales, diagnostic scales and performance scales. By and large, the instruments employed in the measurement of teaching efficiency and related abilities have shown fairly satisfactory reliabilities (6, 8, 20), particularly for group measurements such as made in researches but not for individual measurement. Less success seems to have been achieved in the realm of validity. The reported coefficients of validity seem to fall most frequently in the upper twenties or lower thirties; the reliability

coefficients ordinarily fall in the eighties and nineties (6, 8, 11, 20). The study by Barr and others is probably typical of those in this area. Using a combination of criteria (supervisory ratings, composites of tests of qualities commonly associated with teaching efficiency, and pupil change scores) he secured correlations as follows:

	r
Straper-Engelhardt Teacher Rating Scale.....	.66
Michigan Teacher Rating Scale .....	.65
Gain in Raw Score, Stanford Achievement... ..	.57
Schutte Teacher Rating Scale .....	.57
Torgerson Teacher Rating Scale .....	.55
Pennsylvania Teacher Rating Scale .....	.53
Almy-Sorenson Teacher Rating Scale.....	.50
Giles Teacher Rating Scale .....	.48
Knight Aptitude Test .....	.43
Psychological Examination .....	.36
Torgerson Professional Information Test ....	.35
Social Intelligence Test .....	.35
Gain in Accomplishment Quotient .....	.35
Personality Rating Scale .....	.26
General Merit Rankings .....	.23
Morris Trait Index L .....	.22
Strong Vocational Interest Blank .....	.20
Torgerson Teacher Rating Scale (Self-rating) ..	.20
New Stanford Arithmetic Test .....	.17
Wood Health Scale .....	.04

Many different interpretations have been placed upon the "low" coefficients of correlations found in studies of the validity of different measures of teaching efficiency and related abilities. Some have thought that these low coefficients of correlation indicate a lack of relationship between the qualities and mental prerequisites measured and teaching success; others seem to feel that while the measuring devices may be inadequate, an absence of relationship has not been established (11). Some of the data would seem to support the hypothesis that while no one measure may correlate to any considerable extent with teaching efficiency a number of measures put together through the use of the multiple regression technique may give satisfactory results. The validity of such combinations have been found to vary from .60 to .85 (11). There seems to be a tendency for the multiple R to increase as dissimilar measures are added. Unfortunately the error of measurement also increases such that a point of diminishing returns is sooner or later reached as more measures are added.

Some of the measures for which best results have been secured are (11): the American Council Psychological Examination; the Wash-

burne Social Adjustment Inventory, the Torgerson Diagnostic Teacher Rating Scale of instructional activities; the Almy-Sorenson Rating Scale for Teachers, the Michigan Teacher Rating Scale, the Yeager Scale for measuring attitude toward teachers and the teaching profession, the Hartmann Test of the Social Attitudes of Secondary School Teacher, Torgerson Test of Theory and Practice of Mental Hygiene, and Harnly Statements about Education.

The application of factor analysis techniques to this area has not progressed to a point to supply conclusive findings. Hellfritzsch (11) found a tendency for the factors to group themselves according to the type of measure employed: (1) a verbal factor shown by the grouping of scores on paper and pencil tests of qualities commonly associated with teaching efficiency; (2) an acceptability factor shown by the grouping of scores secured from rating of supervisors; (3) a leadership factor shown by the grouping of scores secured from measures of pupil change; (4) an emotional stability factor; and (5) a specific factor.

Among the results most frequently reported for this area, the following are probably typical:

1. More attention needs to be given to the development of the criteria against which various measures of teaching efficiency may be validated.
2. Further studies need to be made of the factors conditioning teaching efficiency and their interrelationships.
3. Teaching is a very human activity; mental balance, personal and social adjustment, teacher-pupil relationship, and personality seem important factors in teaching efficiency.
4. Other factors which seem to be related to teaching efficiency are intelligence, knowledge of the subject, professional judgment and skill in expression.

Prediction of Teaching Efficiency. Considerable effort has been expended on studies of the prediction of teaching efficiency. A large number of factors have been studied, such as: grades in college, intelligence, reading ability, student teaching, leadership, teaching aptitude, study habits, socio-economic status, emotional stability and adjustment, skill in oral and written English, attitudes on social, political, and economic issues, attitudes toward teaching and the teaching profession, social proficiency, pro-

fessional information and judgment and various personality traits. The work has been characterized by three very general lacks: (1) an inadequate criterion of teaching efficiency; (2) inadequate measures of the factors studied, and (3) faulty experimental design. Prediction can be made at different stages in the training program, such as at the time of graduation from high school; at the time of entrance upon the program of professional education or at the time of college or university graduation. Prediction may be made of academic success and continuance in college; of success in student teaching; or of success in the field. Studies of all of these problems are important; very few long time studies of prediction have been made, however, wherein measures are applied before training and predictions checked against the criterion of field success.

One of the very real lacks in this area is that of a satisfactory criterion of teaching efficiency. All too frequently the criterion of teaching efficiency has been grades in student teaching or supervisory ratings of teachers in service. While the studies (5) in this area seem to indicate that grades in student teaching correlate with later success in teaching to some extent the correlations are not high. They seem to range from around .06 to .70 depending upon the criterion, the nature of the student teaching and the adequacy of the grading. Supervisory ratings made by a single supervisory official are extremely unreliable (4). Composites of two or more ratings are more stable (11, 12) but may still be quite unsatisfactory. It seems inevitable that preconceived ideas, inadequate or inaccurate data and erroneous conceptions of the nature of efficiency may invalidate personal estimates of teaching efficiency. At least theoretically for the time being the best criteria of teaching efficiency would seem to be found in measured pupil changes with factors in pupil growth other than teaching efficiency held constant by statistical techniques or as in experimental research. This latter ideal is not easily achieved.

For further information on predictions the reader is referred to studies by Barr (12), Kriner (29), Odenweller (20), Sandiford (7, 20, 24), and Ullman (29). Barr (12) reports multiple R 's ranging from .60 to .91 for different combinations of measures and different criteria.

The highest zero order coefficients of correlations were found between supervisory ratings and rank in high school graduating class (.29) and predicted grade point average made in the freshman year at the University (.32), university grade point average (.27), grade in practice teaching (.20), prediction of success made by the major department (.38), and prediction of success made by two members of the department of education (.40); the highest zero order coefficients of correlations found between measured pupil changes and such preservice measures as rank in high school graduating class (.69); university grade point average (.53); grade point average in courses in education (.52); prediction of success made by two members of the department of education (.41); general culture test (.23); grade in practice teaching (.21).

In Odenweller's (20) study five hundred and sixty Cleveland teachers, all graduates of the Cleveland School of Education, were ranked by principals, vice principals, and supervisors as to effectiveness in teaching. Correlations were correlated between a composite of ratings and a number of measures: personality (.83); college marks (.29); education marks (.26); student-teaching marks (.19); and psychological marks (.16); age (.15); experience (.15); height (.08); high school marks (.08); handwriting (.06); weight (.02); height-weight ratio (.02); and intelligence (.00).

Kriner (20) using supervisory ratings secured for the four-year college group the following correlations: for the dean's prophecy, .50; for the president's prophecy, .48; for college marks in science, .48; for college student activities, .46; for college marks, .45; for college professional marks, .40; for student teaching marks, .40; for first semester college marks, .23; for college social studies marks, .13. For the two-year group he obtained: for college science marks, .47; for first semester college marks, .42; for the president's prophecy, .42; for the dean's prophecy, .41; for the first two year's college marks, .40; and for student teaching marks, .34. Kriner concluded that teaching success depends upon many factors, the following being the most important: health, intelligence, interest, and leadership. Using supervisory rating made through the use of the Michigan Rating Card, Ullman (29) secured correlations as follows: with social intelligence, .18; with academic in-

telligence, .15; with socio-economic status, .19; with interest in teaching, .02; with academic marks, .30; with professional marks, .30; and with practice teaching, .36.

Sandiford (7) who seems less optimistic than some concludes as follows:

1. Ability of students in teaching is not closely related to intelligence above that necessary for graduation.
2. Ability of students in teaching is not closely related to achievement in special subjects.
3. Ability in practice teaching is not measured by personality tests.
4. The teaching averages obtained in the first term are only a fair index of the final teaching average.
5. Improvement during the period of training is not closely related to intelligence as measured by group tests.
6. If a student has a natural aptitude for teaching, it shows up early.
7. Certain items of information, as determined by a questionnaire, appear to be of value in selecting successful teachers.
8. Ratings of students based on interviews of short duration, even when conducted by a number of raters, are not sufficiently reliable to be used for prognosis.
9. Experienced instructors are unable to segregate effectively those who will prove successful teachers from those who will not.
10. It is easier to select the better students than it is to eliminate the poorer ones.
11. The marks of critic teachers are subject to the variance of individual subjective evaluations.

The research in this area has been in many respects disappointing but with better instruments of measurement, better criteria, and better design better results should be secured. More recent (12) reports in this area would seem to indicate as much.

Selection, Guidance and Placement. Data and techniques such as those described above serve three types of needs that arise in the education of teachers: (1) the choice of criteria for the determination of who shall be admitted to the course for the education of teachers; (2) the validation of concepts and data gathering devices that may be employed in guidance; and

(3) in placement. Such data as are available would seem to suggest that current placement practices are frequently not too well substantiated in fact.

Studies of Factors Conditioning Efficiency.

Prediction studies are all in a sense studies of factors conditioning efficiency. There are, however, some studies of factors conditioning teaching efficiency that are not prediction studies. One might, for example, administer to teachers in service a series of measures of intelligence, skill in expression, cultural background, personality, professional judgment and the like and compare the scores obtained from these measures with pupil change to determine how abilities such as these contribute to efficiency. For the time being the purpose is not to validate measures of teaching ability, nor to make predictions but to explore the conditions for efficiency. A very large number of factors have been subjected to study such as age, sex, training, experience, skill in handwriting, skill in reading, height, weight, height-weight ratio, intelligence, scholarship, cultural background, socio-economic status, health, physical fitness, and various traits of personality. Hatcher (28) employing a subjective rating scale of ten personality traits secured coefficients of correlations ranging from .35 to .77 between trait ratings and practice teaching grades; Laycock (28) found no relationships between practice teaching grades and scores on objective tests of personality. Maple (28) secured similar results. Daldy (6) found in a study of the adaptability of domestic science teachers that teachers who experienced difficulty in adaptation showed inability to express themselves definitely, to react quickly to changes in environment, to make contact with their pupils, or to interest them and to concentrate. Over half the group was rated as ill adapted. Rolfe, LaDuke Gotham, and Rostker (11) secured coefficients of correlation ranging from $-.31$ to $+.35$ between such tests as the Bernreuter Personality Inventory, the Washburne Social Adjustment Inventory, Morris Trait Index L, the Jackson Test of Social Proficiency and a criterion of measured pupil changes. The correlations between ratings of various personality traits and pupil changes ranged from $-.13$ to $+.43$. Engelhart and Tucker (28) found that good judgment, ability to make clear explanations, respect for the opinions of others, sincerity, im-

TABLE VII
A Summary of Relationships between Teacher Factors and Teaching Effectiveness
Defined as Supervisory Rating

Trait	Merriam 1906	Boyc 1915	Knight 1922	Sommers 1923	Whitney 1924	Tiegs 1928	Board- man 1928	Kriner 1931	Ullman 1931	Phillips 1935	Oden- weller 1936	Sandi- ford 1937
Practice Teaching .....	.443	.		.700	.238				.36		.193	
Professional Courses .....	.336	.38	.	.734	.143				.30		.256	
Academic Courses .....	.277	.41			.073				.30			
Scholarship .....	.087		-.214	.707				.36		.228	.293	.20
Estimated Pupil Progress		.88										
Subject Matter		.87										
Organization .....		.47			.124							
General Appearance .....		.62*	.088	.425	.025		.332		.15	.257	.004	
Intellectual Capacity .....			.570				.258			.280		
Professional Tests .....										.209		
Dominance .....				.615						.066	.825	
Personality .....									.18			
Social Intelligence .....				.77	.991			.76				
High School Record .....						.08						
Recommendations .....						.04						
Letters of Application						-.08						
Photographs						-.21						
Rating Scale .....							.389			.232	.146	
Experience												
Leadership												
Age .....							.342	.59	.02	.102	.146	
Teaching Interest .....								.19		.217		
Socio-Economic Status ...												

* Subjective estimate of intellectual capacity.

partiality, firmness, appreciation, interest in pupils, broad mindedness, and knowledge of subject as rated by pupils correlated highest with teaching success.

Davis (28) found that experienced teachers were more successful than beginning teachers but that no relationship seemed to exist between the amount of specialized training possessed by a teacher and the success of his students in state high-school examinations. Stuit (6) found that of successful teachers, 11 per cent had grades below 80, and 19 per cent were above 90; of the inferior, one third were below 80 and 13 per cent above 90. The correlation with teaching success was .31. Coxé and Cornell (28) found no significant relationship between an entrance examination consisting of a

battery of seven objective tests and later success in the field. Rolfe (11) reports low correlations between age, training, and experience and measured pupil gains. Young (6) studied conditions affecting the teaching efficiency of 1,521 Texas high school teachers. He concluded that efficiency is influenced by a number of factors such as training and experience but that other qualities less tangible and more difficult to measure are essential. Leyfirst and Tyndal (28) found significant differences in the scores of pupils taught by good and poor teachers on an objective test in science. Lancelot (20) found significant differences in the persistence and in the quality of work done by students of a given instructor in later courses of a prescribed sequence.

TABLE VIII

A Summary of Relationships between Teacher Factors and Teaching Effectiveness
Defined as Pupil Change

Factor	Crabbs 1925	Taylor 1930	Armstrong 1935	Barr et al 1935	Rostker 1939	LaDuke 1941	Rolfe 1944
Professional Knowledge (several different tests) .....	.04		.06	.21	.11	— .31	
Rated ability to teach (misc.)...		.24		.27	.26		
Intelligence (Amer. Council) ..			.20	— .01	.58	.53	.10
Teaching Aptitude (Stanford) ..			.02	.12	.10		.08
Leadership (Morris Trait Index L)				— .07	.26	.26	— .20
Knowledge of Subject (several different tests) .....				.01	.36— .58		.01
Health (Wood) .....				.11			
Personality (unstandardized) ..				.11			— .13
Professional Interest (Yeager) ..				— .10	.45	.16	.22
Social Intelligence (Moss; Jack- son) .....				.19			— .35
Social Attitudes (Hartman) ...					.52		.38
Mental Hygiene (Torgerson) ..					.46	.35	.22
Neurotic Tendency (Bernreuter)					— .31		— .14
Orientation .....					.30		.10
Teacher Rating (Torgerson) ..					.35		.43
Ability to Organize Material (Wrightstone) .....					.58		
Self-Sufficiency (Bernreuter) ...					.20		— .11
Dominance (Bernreuter) .....					.25		.04
Social Adjustment (Washburne)					.13		.06
Socio-Economic Status (Sims) ..							— .22
School Size .....							.28
Salary .....							.25

Several studies have been made of professional training, judgment, and information. Using supervisory judgment Knight (4) secured a correlation of .54 for the Knight Aptitude Test, Whitney (4), a correlation of .14 for pro-

fessional marks and Boardman (4) a correlation of .26 for professional information.

Boynton (28) and others studied the emotional stability of teachers and pupils who had been together for two and one-half months

and found that emotionally unstable teachers tend to have associated with them children who tend toward instability, whereas emotionally stable teachers tend to be associated with more emotionally stable pupils. Nichols (28) and others conclude that poorly qualified teachers are detrimental to pupil adjustment.

A summary of a correlation between certain teacher factors and teaching effectiveness as measured by supervisory rating is given in Table VII. A summary of a correlation between certain teacher factors and teaching efficiency as measured by pupil change is given in Table VIII.

Education of Teachers. By and large, educationalists have been more concerned with practices and policies and the curriculum for the education of teachers than with how one learns to teach, individual differences in teaching ability, principles of learning, learning difficulties and the processes of learning for the acquisition of different abilities, skills, knowledges, interests, attitudes, ideals, qualities, and competencies, prerequisites to teaching efficiency. Of the several hundred studies surveyed with reference to the education of teachers none seemed to be primarily concerned with the psychology of learning to teach (21, 22, 23).

Mental Health of Teachers. Considerable attention has been given to the mental health and adjustment of teachers (27). Symonds (8) found that personal problems overshadowed all others, with family relationships, love life, feelings of inferiority and superiority, health, difficulties with teaching, financial problems, making social contacts, and difficulties with superior mentioned most frequently. Hicks (3) found that one-fifth of the women teachers were unduly nervous; that 11 per cent had had nervous breakdowns; that 12 per cent knew they were anemic; that 7 per cent had lung trouble; and that 7 per cent had had heart disease. A psycho-neurotic condition was found twice as prevalent among women teachers as among men. O'Malley (3) found many things annoying and irritating to teachers. Peck (3, 20) using questionnaires and tests found that one-third to one-fifth of 100 women teachers studied reported adjustment difficulties. Phillips and Greene (27) found that for single women there was an increase in neuroticism until age thirty and a decline thereafter while with married teachers there was a gradual decline with age. Zach-

ary (3) emphasized the importance of having well-adjusted teachers in our schools. Prescott (20) emphasized the need for studies to determine the extent to which the profession offers adequate opportunities for the satisfaction of basic personal needs of teachers such as freedom from fatigue, marriage, receipt and bestowal of affection, social opportunities, security, full rich experiences, freedom to exercise initiative and creative thinking. Emotional immaturity, lack of adaptive ability, absence of interesting hobbies, and idiosyncrasies resulting from conflict with associates are listed among the most frequent causes of mental ill health (27).

For further discussion of this problem the reader is referred to the bibliographies attached to the following references.

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PHENOMENOLOGY.—Phenomenology, the science of phenomena, is a presuppositionless, but systematic, exploration and description of experience, including both acts and contents, both sensuous imagery and disclosed meanings. All sciences, including the science of psychology, take their point of departure from phenomenological descriptions. For example, the psychological study of receptive processes would be impossible apart from phenomenological description of the relationships among different qualities of sensation. The so-called color solid, taste tetrahedron, odor prism, and so forth, represent summaries of phenomenological explorations.

Contemporary phenomenology received a great impetus from the systematic work of E. Husserl, who was a student of Brentano, the Austrian Act psychologist. Brentano, following the Scholastics, had taught that every experience has an object, and every type of act has its terminus in a specific kind of content. Phenomenologists assume that description is logically prior to deliberate categorization and deliberate explanation. Like Descartes, Husserl espouses the ideal of methodical doubt as a first step in all scientific and philosophical work. The given must be described in its full immediacy before its development can be explained, or its status in reality can be determined.

Most serious accounts of creative thinking are essentially phenomenological. Henri Poincaré, the famous French mathematician, has given phenomenological descriptions of mathematical reasoning, and T. Ribot, French psychologist, has described the experienced stages in various processes of mechanical invention. Leone Vivante, an Italian phenomenologist, has stated that creative solutions to problems occasionally transcend all the ordinary principles of association. Such achievements require unique schemata of comprehensibility. They do not conform with average or conventional schemata. Perhaps only a genius could appreciate the creative experiences of another genius, and the attempt to explain them would be even more difficult. The height of folly would be to attempt to explain something which one has heard mentioned but which one has experienced in no sense more direct than the verbal.

Certain psychopathologists have done essentially phenomenological work. Freud, Zilboorg,

and especially Jung are among those psychopathologists who have insisted that the content of abnormal mental processes must be understood in order to achieve a basis for adequate diagnostic and therapeutic work. Some phenomenologically inclined psychopathologists have noted that inner happiness is enjoyed only insofar as positive values in an experienced world predominate over negative values. Self-evaluation and world evaluation are components of a unitary process. In an inimical world the person evinces inflated egoism or extreme aggressive attitudes. If there is no basis in a personal world for faith and hope there is also no basis for humility and charity. If egoism and aggression predominate, anxiety and guilt feelings are also evident. These are not moral judgments, but rather are generalizations from many phenomenological descriptions of the content of the personal worlds of maladjusted people. Yet perhaps some moral judgments are founded upon such factual generalizations.

J. J. Rousseau made some generalizations which perhaps could be reduced to a broadly observable phenomenological basis despite the fact that many critics have considered his thoughts to be arbitrary. Rousseau stated that only the natural man is happy. Possibly contemporary observers of human experience are in a better position than Rousseau to test such a generalization. Some have maintained that the increasing proportion of mechanical artifacts and other inorganic objects in the contemporary urban environment is accompanied by deterioration in characteristic personal moods. Living creatures other than human beings are increasingly excluded from the typical life space of modern man. As time passes fewer people with memories of surroundings which present a great plenum of living orders remain present to enhance the tone of urban existence. The diversification of values continues, and this is called "progress." At the same time the human sense of a basic, all-embracing value, which might be called the life value, is being lost. If these generalizations are correct, or even if they only dimly reflect the basic human situation, some practical implications of them should be investigated by applied psychologists and social engineers generally. Experiments in building communities which offer the participants a blend of urban and rural experiences

should be initiated. The confusion between a rational, social control of some natural processes through cooperative exploitation of a technology, on the one hand, and complete alienation from the old sense of kinship with nature, on the other hand, may be one of those confusions which are responsible for the increasing cynicism and hatred in so many contemporary life experiences.

A phenomenologist may describe systematically any person's direct experience in its totality. Each individual may know and describe his own experience by means of introspection, but knows other persons' experience through some medium of their expression. The phenomenologist does not prejudice the problem as to whether a systematic knowledge of one's own experience is easier to attain than a systematic knowledge of another's experience. Although a person experiences just what he experiences, it by no means follows from this by any logical necessity that the person must attain a systematic knowledge of the contents of his own experience. Phenomenology, whether referring to internal or external experiences, is a task. Systematic knowledge of the directly experienced is itself an end product of phenomenological exploration.

Integral phenomenology is the systematic exploration and description of personal worlds. It describes that which appears in the various streams of consciousness. Whether these systems of experience are utterly discontinuous is another question which the phenomenologist would not prejudice. Such concepts as that of quantitative or qualitative monism or pluralism are philosophical constructs and are beyond the scope of phenomenology. The phenomenologist may note relative continuities, or discontinuities, but he does not speculate about ultimates. Phenomenological description provides a legitimate basis, however, for scientific theorizing or for philosophical speculation.

A phenomenological description of a continuum of behavior would provide a basis for psychological theorizing. In the phenomenological description both actions and consequences, productive processes and consequent products would be described just as they are directly experienced. Some continua of behavior provide no self-evident basis for drawing a distinction between deed and consequence, creative act and created result. Similarity, some

social behavior, such as the cooperative production of goods might show results the precise individual contributions to which would not be self-evident. To the phenomenologist, unity in the product might be more conspicuous than any diversity which were determined by the multiplicity of cooperating productive workers. The individual contributions might be merged in a common effect. If certain psychologists preassume that there must be a complete dichotomy between person and expression, on the one hand, and between the personal and the collective, on the other hand, that assumption reflects simply the interests of theory and is not necessitated by all direct experiences of behavior. Like all specializing sciences, psychology sometimes tends to distort given situations of experience, if only by positing arbitrary divisions or arbitrary outer boundaries. Thus many scientific data are partly constructs. Such construction may, or may not, lead to errors in the consequent theorizing. The phenomenologist believes, though, that the scientific specialist clearly should understand at just what points and in just what respects his data have distorted the original phenomenological evidence.

A phenomenological description of cultural artifacts would go beyond objectivistic functionalism, such as that developed by the brilliant theorist Bronislaw Malinowski, since the values of artifacts could only be described insofar as the culture context were experienced in the way that the members of the particular culture experience it. From the phenomenological standpoint, a culture is simply a specific class of personal worlds. The artifact has a value within worlds of one class that is not experienced in other worlds. Similarly, the engineering value of an object differs in different orders of technology despite the fact that some common physical characteristics of it are apparent within the perspectives of all the orders.

A person may interpret himself as being a product as well as being a producer. The psychological subject is both a patient and an agent. Therefore the contexts and imperatives of self-knowledge and self-engineering provide few, if any, exceptions to the above principles concerning phenomenological understanding.

Some personal products are symbolic expressions of the person's quest for broader contexts and more compelling imperatives. Art, litera-

ture and some personal documents are among such products. Through interpreting complex systems of personal expression, phenomenologists may experience the ideology which is proper to a particular personal world or class of personal worlds. The critical problems arising from this last consideration are beyond the scope of this article. (See the article on Personal Document Analysis.)

Nicolai Hartmann has pointed out that phenomenology and explanatory science are reciprocally dependent. All scientific hypotheses are imaginative interpretations of phenomenological evidence. In turn the hypothesis may suggest physical operations through which novel experiences are achieved, and novel contents are made available for systematic phenomenological exploration and description.

Phenomenology and logic are also mutually dependent. As Husserl pointed out, the intuition that two plus two equals four remains even when physical combinations of two units with two produce a fifth. Supposing, however, that every physical combination produced a different sum of objects than is actually the case, we should then have a different physical world. And for each physical system a certain basic arithmetic is most fitting. Others may be derived from it.

Like his world, the person is a relative unity. Normal personal experience never conforms to analytic categories. Contents which trace to the past are blended in the present affective unity. Also, every situation which the person experiences contains aspects of his world other than those which are directly related to the purposes which appear in it. To interpret any situation, one must appreciate the series of which it is a member, and such appreciation would complete an integral phenomenology of a great and unique world of affection and reason. Such worlds, no matter how clearly or critically their main internal contrasts are interpreted, may seem exotic or disconcerting just because their independence of one's own personally characteristic imagination is thus indicated. So within the phenomenological universe of discourse solipsism is transcended, and the assurance of participation commences. The reality and something of the value of the fellow-being is experienced directly, and the mockery of abstract scepticism is forthwith overcome. This is the "Open Sesame!" to that limitless social

world, the whole realm of persons; to that for which all science plays a servile role and from which psychological science receives its special imperative to serve man by helping him know and guide himself.

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PHILOSOPHICAL PSYCHOLOGY.—

Only slightly more than a century ago, psychology was definitely a part of philosophy and dealt speculatively with some of the central problems of epistemology and metaphysics. Since that time, however, psychology has largely broken with its parental discipline, assumed a considerably more factual and practical position, and assimilated the methods of study and research borrowed from physics, biology and education. As a result of this break, many of our best scholars look askance today at anything smacking of metaphysics or introspection, call philosophical psychology obsolescent and declare, with H. H. Remmers, that "our philosophical inheritance has unfortunately not been an unmixed blessing."

But the ties with the past are strong; moreover, there has really never been a reason to make the break with philosophy excessive. The fact is, anyway, that in quite a few of our colleges the young science is still classified together with philosophy and taught by instructors from the same department. In the Catholic institutions of higher learning it is dominated by the teachings of Aristotle, as interpreted by St. Thomas Aquinas, in which form it constitutes an essential part of neo-scholasticism. Besides, there are numerous psychologists who contend that quantitative research is being over stressed and that the further progress of the science

demands a serious revision of its theoretical foundations, requiring a great deal of skill and vigor in reasoning. Thus, K. Lewin states: "Investigators are coming to feel that a mere piling up of facts can only lead to a chaotic and unproductive situation. . . . Only with the help of theories can one determine interrelationships." In W. Koehler's belief, "too great an interest in present quantitative methods and in their standardization is not a hopeful response to the fact that the development of psychology depends upon the discovery of new methods and problems in the future, and not upon the monotonous repetition of a few standardized methods which fit only primitive problems." According to C. A. Ruckmick, psychology can "well afford to cease its feverish activity in the accumulation of so-called facts and to try again to envisage the forest as a whole." In P. L. Weber's opinion, "the time seems opportune and ripe for a positive reconstruction on a large scale."

The mainstay of philosophical psychology is undoubtedly the formulation, study and analysis of the basic concepts of psychology as a whole. Among the concepts inherited by us from the past but preserving their importance the most prominent are: mind, self, consciousness, and cognition by perception.

The original interpretation of the first of these concepts was that of a metaphysical substance, sometimes confused with the soul. The dualistic theories described mind as an independently existing substance, distinct from matter. According to Descartes' interactionism, the two substances were connected in the pineal gland, "the seat of the soul." Spinoza, however, denied interaction and regarded mind and matter as two of the attributes of the infinite substance, or God. Malebranche saw in the relationship the hand of the Supreme Being, for whom every event in mind or matter offered an occasion for a creative act. The monistic theories, on the other hand, assumed that there is but one substance. The idealists of Platonic descent interpreted matter as mere appearance only misleading human reason. Berkeley came to the conclusion that, as nothing external can be known directly except images, it is superfluous to postulate the existence of anything but perception, human and divine. Leibniz regarded matter as consisting of monads, or little souls, and taught that the relationship between

what exists in space (matter) and what happens in consciousness (mind) rests on the principle of pre-established harmony. During the 18th century there arose considerable opposition to the idealists in a number of materialistic movements, all teaching that mind is a modification or element of material substance. Thus, Cabanis contended that mind is a function of the brain, just as the secretion of bile is a function of the liver. More recent epiphenomenalism of Clifford, T. Huxley and Hodgson interpreted mind as a by-product of physiological processes, a sort of "whistle of a steam engine." The double aspect theory, or identity hypothesis, presented mind as "the other side" of organic matter, but essentially identical with it. Kant's critical idealism and Hegel's objective idealism compromised between dualism and monism, in that the former took an agnostic position with regard to "things-in-themselves," whereas the latter taught that material reality is endowed with the quality of rationality representing the Absolute Idea.

Whereas mind, as a metaphysical substance, is only of historical interest to the psychologists of today, mind, as the sum-total of one's experience, is still of great but somewhat puzzling significance. They cannot accept Hume's position who, having examined his own mental processes and having failed to find introspectively anything but succession of individual experiences, concluded that there was no self. For to them the interpretation of mind as the sum-total of one's experience is inseparable from the notion of self. It is clear indeed that there persists something throughout the many changes of one's life, by virtue of which one calls himself 'I' and distinguishes himself from all other individuals. Depending on the choice of emphasis, this self is identified mainly with the living body and characteristics pertaining to it, in which case we deal with what may be called the physical self; or else it is identified with "the organization of experiences in a dynamic whole," as W. Pillsbury put it, in which case we deal with what may be called the psychological self. The Behaviorists tend to confine the notion to the former, as "the behavior of the human being as a whole," whereas Freud and the psychoanalysts extend the notion even beyond the latter, to include also and mainly "the unconscious mind." In the earlier

psychoanalytic literature, to be sure, the self was treated as essentially synonymous with the ego and stood for the seat of the conscious and self-preservative functions of life. Later, however, the ego came to acquire a more specific significance, namely, to refer to the organized portion of the mind, which is derived from the id and controls voluntary thought and activity as well as the external manifestations of emotional tensions.

In addition to being a persistent and normally growing totality, the self is often understood as subject, in its opposition to objects, or to everything that is "not-me," as described by William James in the following passage: "One great splitting of the whole universe into two halves is made by each of us, and for each of us almost all of the interest attaches to one of the halves; but we all draw the line of division between them in a different place. When I say that we all call the two halves by the same names, and that those names are 'me' and 'not-me' respectively, it will at once be seen what I mean." This meaning of self appears to be so important that, whether recognized or not, it lies at the foundation of all discussions, and actual manifestations of course, of self-interest, egocentrism, egoism, and aggressiveness.

Closely connected with, but distinct from, mind is the concept of consciousness. Some psychologists assert, with J. B. Watson, that "states of consciousness . . . can never become data for science" and that psychology should "discard all references to consciousness." Others point out, with G. M. Stratton, that no scholar realizing "the difficulty of a scientific study of our conscious life" should "give up the fight when it has hardly yet begun" and thus "give over to hopeless ignorance what to many men is the most interesting side of our life." The truth is, however, that the great majority of people find themselves utterly unable to doubt the existence of consciousness. Nevertheless, it is exceedingly hard to define consciousness or to study it. The only well-known but clearly unsatisfactory definition of it is that by Ladd, namely: "Whatever we are when we are awake, as contrasted with what we are when we sink into a profound and dreamless sleep, that is to be conscious." The study of consciousness is seriously aggravated by the fact that it completely excludes objective observation and meas-

urement, except as revealed in its consequences, such as physiological changes, expression, and behavior in general. Introspective findings are bound to remain personal and subjectively significant. But such findings are not, therefore, scientifically worthless, especially with regard to broader generalizations and principles of wide application. It should not be very difficult to agree, for instance, that human experience has two aspects, one observable by outsiders, as behavior, and the other known only to the subject, as his own awareness. The two aspects overlap, in so far as behavior is not necessarily conscious in all of its phases and consciousness is not necessarily observable even in its bodily manifestations. Awareness has been, to be sure, interpreted as a form of behavior, notably by John Dewey and the pragmatists. Bergson, too, contended that "the orientation of our consciousness towards action appears to be the fundamental law of our psychic life." Another point on which there is much agreement is that consciousness is, in William Stern's expression, *unitas multiplex*, a unity with complex and varying contents. If we realize, in addition, that conscious mental processes constitute a progressive succession of states, which can never be completely stopped, we are ready to accept what James designated as "the stream of consciousness" (or thought). As E. G. Boring recently remarked, "the most striking thing about consciousness is its continuous flux and change." Such findings are hardly controversial, except in their particular formulations; and, were it not for our fear and distrust of introspection, it would not be impossible to refine the method to such an extent as to make it one of great scientific value.

The problem of perception is closely connected with that of the knowledge of the external world. Though common sense, or naive realism as it is called in this regard, insists that we are introduced by our senses directly to realities of space, no one has ever been able to show exactly how this is achieved. In fact, ever since Locke demonstrated that there are no innate principles of the mind, it has been acknowledged that the only cognitive experiences the human mind is capable of are perceptions and ideas. In other words, mental operations are confined to mental material. This raises two basic problems, first, what may be

the distinction between elements of the mind and the corresponding outer realities, and second, how cognition can transcend its own boundaries. The former question is answered by the postulate that images of things are existentially and probably qualitatively different from the things themselves, although it is still a moot problem as to precisely what the difference may be; and the latter question presupposes, in L. E. Hahn's words, "passing beyond the 'inner' data to the 'outer' physical world of moving particles." Despite all the speculation and investigation, from Plato's days up to the present, no satisfactory solution of the problems has been obtained. Perception remains largely a mystery, even though it is possible to define it safely as awareness of external objects, events, relations, and qualities. It seems that such awareness depends for its causation on sensations, that is, on processes of stimulation of sense organs and on the transmission of resulting impulses along nerve fibers to brain centers. It is there that awareness of external reality arises, as a result of combined activity of several centers or through what Pavlov called "irradiation." This is a distinctly psychological phenomenon of perception in which images are attributed, or projected, to the source of stimulation, whether it be located inside or on the surface of the body, as in the case of the so-called body senses, or outside the organism, as in the case of the so-called space senses, namely, vision, hearing and smell. This process constitutes, in R. W. Sellars view, an "activity in the reverse direction of that of sensing." Moreover, perception does not leave the images intact, but "interprets" them; that is to say, perception consists largely in selection, organization and modification of the material presented to the mind by sensations.

We have devoted the bulk of this brief discussion to a few basic concepts of historical significance. But the field of philosophical psychology covers all psychological concepts, of course, including those formed in our own days as well as those still in the making. To this group belong, to take a few concepts at random: personality, motivation, adjustment, projection, repression, neurosis, morale, environment, habit, configuration, meaning, extra-sensory perception. None of them has been adequately defined or analyzed, none of them is

sufficiently clear, perhaps because they are still transient in their nature. But they should not be allowed to remain vague, ambiguous or erroneous, as the case may be. It would not do, for instance, to keep on regarding intelligence as that which the intelligence tests measure. We should realize that, in the last analysis, the use of words has its responsibilities in any science. Facts alone will not create sound terminology in psychology. It must correspond to adequate concepts, skillfully selected, grounded in truth, refined by reasoning, and clarified in extensive discussion. This, in short, is the practical function of philosophical psychology, not vague speculation and the language of abstractions.

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PHYLOPATHOLOGY.—The terms “*phylobiology*” and “*phylopathology*” refer to behavior and its disorders and were introduced by Triggant Burrow to describe the researches of himself and his associates into these disorders. These investigations, originated by Dr. Burrow, represent a type of behavior-study that is not to be identified with prevailing psychological or psychiatric schools. From the altered frame of phylopathology behavior-disorders are regarded as conditions that reflect a biological disturbance within the organism of individual and phylum. This disturbance involves a dislocation of feeling within the system of the self. It involves an “*affecto-symbolic impasse*” that distorts human relations, both personal and social. The investigation is directed specifically toward determining the neurophysiological substrate of the condition and toward developing practical means of readjusting this maladaptation in its extension throughout the species man.

An understanding of the altered approach of phylopathology to individual and community behavior will be assisted by considering its various aspects in their historical sequence. Burrow, who as a charter member of the American Psychoanalytic Association was one of the first adherents and promoters of psychoanalysis in this country, wrote a number of papers between 1911 and 1918 in which he presented principles that greatly modified and extended the implications of traditional psychoanalysis. Abrogating the view that behavior-disorders are restricted to neurotic patients, he maintained that “normal” behavior embodies a type of adaptation that is also distinctly deviate, that “normality” too contains elements that are self-reverting, substitutive and discrepant. In accordance with this position so-called normal social behavior was included along with neurotic reactions in the material to be investigated.

Observation of the “*social reaction-average*” commonly regarded as normal disclosed the existence of affect-impediments, of “an inherent social disharmony” in man’s behavior as a community. It disclosed subterfuges and distortions associated with the tendency in man to center emotional interest upon his own image. The disharmony is thus coterminous with the development in man of self-consciousness. This ethnic mechanism led to a host of behavioral interferences whose social systematization Bur-

row at that time referred to as a “*world neurosis*” or the “*neurosis of the race*.” Thenceforth he consistently emphasized the universal distribution of this biological impediment and pointed out that normality, as commonly interpreted, cannot be considered a reliable criterion in the understanding and treatment of neurotic disorders.

In contradistinction to this “normal” mode of adaptation with its self-conscious, ulterior interests and reactions, Burrow drew attention to the evidences of a more basic, unsophisticated, preconative, or “*preconscious phase*” of behavior. He also used the terms “*primary identification*” and “*nest-instinct*” in describing this original organismic phase of solidarity and continuity as it is exemplified in the biological identity between the mother- and infant-organisms. Evidence was presented from the life of normal and neurotic individuals, from poetry, myth and ethnological sources in substantiation of this primary functional pattern. An organic principle of continuity and coordination was sharply differentiated from the self-interested attitude of competition and personal gain that now characterizes normal social interrelations.

This more encompassing outlook led to an altered interpretation of the factors responsible for neurotic conditions. The suppression or interruption of the original mode of man’s interrelational adaptation by secondarily acquired, self-preoccupied drives was seen to be the basic factor in the causation of behavioral conflict and neurosis. At the same time Burrow saw in many neurotic manifestations a constructive element, “a protest of man’s inherent truth against the duplicities and subterfuges of the normal social program.” From this background, what we commonly know as sexuality and its moral repression were regarded as manifestations of the secondary, self-reverting, invidious sphere of adaptation. The readjustment of the neurotic personality to this competitive social norm constituted only a temporary, symptomatic alleviation. Furthermore the psychoanalyst, while maintaining the conventional attitude of professional aloofness, was himself necessarily a participant in man’s social unconscious. He too was an inevitable part of this “confederacy of unconsciousness popularly endorsed as normality.” Thus it was early found that the fundamental problem consists in a basic conflict between the organism’s primary, coordinated

mode of adaptation and a secondary, self-reflexive mode. It was found to consist in man's vain effort to reconcile his developing self-consciousness with his basic functional integration and growth as a conscious social organism.

The method of "group-analysis" which Dr. Burrow later called "phyloanalysis" and which, with the cooperation of his assistant, Mr. Clarence Shields, he introduced and developed in the years following 1918, afforded an opportunity to supplement and bring to practical test his altered concept of the neuroses and of behavioral maladjustments generally. In our laboratory setting the interrelational attitudes and reactions occurring within the group were observed and examined for their underlying content. They were observed not in retrospect but in the actual moment and they specifically included the immediate reactions of the observers themselves. To this end experimental groups met regularly several times a week; they were composed of from four to twenty individuals, both "normal" and "neurotic." In addition, in later years observations which were no less controlled took place in quite informal settings, such as during the meal hour and other routine activities.

Consistent with this procedure, expressions of normal behavior or of the social reaction-average were not necessarily regarded as bona fide but were treated as laboratory material and analyzed with respect to their latent dissociative trends. Manifestations of sympathy or revulsion, of propitiation or irritation, of "liking or disliking," of entrenched authoritarianism or sentimental dependence, of elated or depressed reactions—these and endless similar dichotomies we were obligated to view with objective dispassionateness. Further, these alternating responses and the kindred behavior-fluctuations that make up man's dynamically interrelated system of social interchange were not treated as isolated incidents characterizing this or that specific individual. They were regarded, instead, as symptomatic expressions of a disorder that affects man as a community or "*phylo-organism*," and from this broader organismic perspective we sought to determine the common denominator that inheres in this vast complex of behavior deviations.

These findings corroborated Burrow's earlier observation of a secondary, distorted motivation extending throughout the behavior of man

as a species. Everywhere the activities of individual and group showed evidence of the disturbing influence of a spurious self-image or "*I-persona*" and its social projections. An unconscious addition to "*social images*"—a disposition to arbitrary phantasy-formations which have become socially systematized—was seen to exert a disorganizing influence upon man's interreactions generally. This distortion of primary feeling-processes through their false attachment to the symbol has resulted in a medley of behavioral symptoms: in fear and self-defense, in insecurity and competitive aggression, in guilt and its inevitable over-compensations, in obsessive acquisitiveness—personal, sexual, social, political, religious, economic—and its moralistic disguises. These symptoms of "*the social neurosis*" were found to be an inseparable part of our "normal" behavior, irrespective of personal and cultural variations. They were found to constitute a continuous reaction-tissue which interweaves with prevalent patterns of socially accepted codes and mores. Such socially conditioning forces corroborate the secret autocracy and antagonism of the "*I*"-persona and thus stimulate and maintain disordered community function. In brief, the social neurosis was seen to consist of a correlation of individual and social symptoms, whether expressed in the presumably well-adapted personality, in the substitutions and inhibitions of neurotic tendencies, in the antisocial and destructive trends of war and criminal reactions, or in the imbalances and maladjustments of our economic, industrial and political life.

We must conceive of a phylogenetic miscarriage of function through which man's affective images have become so widely systematized socially as now to function independently of the organism's basic behavioral assets. The symbolic part-function, while invaluable in man's internal economy and in his daily management of the environment, has misappropriated the phyloorganism's essential feeling-processes, diverting them into spurious self-interests or "*partitive*" motivations that possess no biological value for the organism as a functioning unit but that, on the contrary, obstruct an adjustment consistent with the laws of the phyloorganism as a whole.

Early group-analytic observation of these behavioral inadequacies in individual and community led to certain modifications in the ex-

ternal reactions of the participants, to a mitigation of secondary neurotic symptoms and of obvious antipathetic trends. But the underlying phylic disturbance expressed in the symptoms of the social neurosis—the esoteric absolutism of the “T”-persona with its social projections—remained undissolved. That is, the inevitable social systematization of our experimental setup, because of habitual autocratic community preconceptions, still tended to obstruct even the process of observation and to oppose a powerful barrier to consistent analytic investigation. With continued experimentation and growing insight into phylic processes we became aware of the impossibility of reaching a more basic adjustment through mere “*socio-symbolic*” procedures. The realization of this impasse was naturally a frustrating experience but it forced our investigation toward the more basic aspects of man's interrelational maladaptations.

In the process of phyloanalysis Burrow had earlier observed in himself the presence of a physiological stress or tension in the frontal and ocular regions—a tension which he found increasingly to be associated with the incidence of affective trends. This observation furnished the clue to an altered basis of procedure. For with the recognition of this physiological stress there came about a coincident awareness of the organism as a total entity. So that we ceased thereafter to pursue the analysis of the secondary resultants of affecto-symbolic behavior, whether enacted or fancied. Attention was directed now toward intrinsic bionomic processes, specifically toward the discrimination of patterns of tension perceptible within the organism. Investigation was occupied with the internal conflict between the circumscribed pattern of the affecto-symbolic segment and the pattern of reaction of the total organism. It gradually became clear that the neuromuscular tensions involved in the formation of affect-images were coterminous with the systematization of tensions embodied in the “T”-persona. It was possible to make out experimentally that the tensions characterizing the “T”-persona have their seat in the forepart of the head and in the region of the eyes. With practiced observation the organism's localized pattern could now be more or less sharply differentiated from the tensional pattern of the organism as a whole. From the background of the total organismic pattern it became possible to sense and observe

the limited pattern of the “T”-persona and its socially conditioned behavioral resultants. It is therefore the thesis of phylobiology that the interference or conflict between two irreconcilable tensional patterns constitutes the organismic denominator to which disorders of behavior must ultimately be referred.

Through this experimental technique there developed a modification in internal constellations in which the organism was able to recognize with increasing consistency the physiological difference between the motivation of the total pattern of behavior and that of the specific partial pattern. With this fundamental readjustment, there occurred an automatic shift in the customary process of attention or adaptation in relation to the environment. An altered mode of attention became operative, and this mode Burrow called “*cotention*,” contrasting it with “*ditention*” or the self-interested partitive attention of normal adaptation. Coincident with cotention there was the reassertion of a “*central constant of motivation*” whose function is phylogenetically prior to that of the system of affect-images with which psychiatry, psychoanalysis and “normal” pedagogic methods habitually deal. This approach entailed a complete reorientation in organism-environment relationships, a change which deeply affected interrelational feeling and behavior. Conflict and disorder as they influence the customary reactions of individual and group took on an altered meaning. From the cotentive frame of reference the pathology of the “T”-persona stood out in clear relief as a condition characteristic of man throughout. From the background of this larger pattern the symptoms of the social neurosis, or of habitual ditention, were seen as universal, phylic phenomena.

In a word, cotention makes possible the clarification and readjustment of accustomed processes of feeling and thinking. It makes possible the realization of the phyloorganism's primary coordination as well as of the contrast between this configuration and the many behavioral distortions of both “neurotic” and so-called normal social manifestations. The localized affecto-symbolic or ditentive pattern loses its stress and urgency—a consummation which was found to outlast the immediate experimental periods. Concomitantly there is the disappearance of habitual self-centered preoccupations. Affect-images are dissolved, the symbol is restored to

its proper place within the functional coördination of the total organism, and a more direct interaction between organism and environment comes into its own. This reorientation of outlook, of motive and of action becomes effectual in everyday activities and brings the social level of behavior more and more into alignment with man's primary phylic function.

It was of special interest to observe that the differentiation between the two patterns of behavior, dition and cotention, is accompanied by specific physiological modifications recordable by appropriate instrumental methods. On the basis of this differentiation various physiological functions were submitted to experimental investigation. We found that on shifting to the cotentive pattern there immediately occurred a marked slowing of respiration. This slowing of respiration from an average of 12-14 per minute in dition to an average of 3-6 in cotention was consistent. Another series of alterations had to do with eye-movements. We observed a marked decrease in the frequency and in the range of eye-movements during cotention. But observations of this feature by means of an especially devised photographic apparatus are still in progress. In addition, a study of the electrical brain potentials, amplified by the Grass method of frequency analysis, showed that in cotention there is a decrease in the alpha-component and in the amplitude of the brain-waves.

These physiological modifications support the evidence that the internal reaction-shift coincident with cotention involves basic neurophysiological factors. The physiological changes observed in dition and cotention as well as the behavioral processes involved are related both to the cortical and to the basal areas of the brain. The close connection, therefore, between behavioral and physiological features is not surprising. This interconnection and the recordable nature of these factors remove the investigation of behavior-disorders from the realm of mere inference and speculation, and place it upon a concrete objective basis.

The principle of organismic integration or coördination which phylobiology applies to man's social interrelations constitutes an extension of the *principle of primary identification* or of the *preconscious mode* posited by Burrow in his early formulations regarding the organism's ontogenetic continuity and coördination.

Subsequent experimental differentiation of internal tensional patterns reactivated these primary organismic assets and brought them to pragmatic operation. Reports on the structural and functional coördination of the living organism as observed in other biological fields further strengthen the evidence of this onto- and phylobiological principle.

It need hardly be emphasized that the various types of group therapy that have arisen in recent years differ radically from the scope and procedure of phyloanalysis. While Burrow's work undoubtedly gave the original stimulus to various group developments, none of these subsequent "group" procedures envisage a reorientation that is fundamental and "*neurodynamic*." They do not envisage the presence of a widespread "*phyloneurosis*," nor does the psychotherapist recognize his own involvement in it. He merely makes use of accustomed social standards, of which he too is necessarily an unconscious part, in order to accommodate the patient to the accepted social norm. It is the position of phylobiology, on the other hand, that the individual who represents the customary norm or the average social reaction deviates from a scientifically determined biological norm no less than does the maladapted patient.

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POINTS OF VIEW.—*Components of psychological theorizing.* As in other disciplines, theoretical contemplation and organization in psychology serve primarily two purposes: to prepare as well as to interconnect observations which otherwise would be, or appear to be, unrelated or incidental. In this endeavor, carefully defined or elucidated *concepts* are combined to form *hypotheses, postulates, or laws*—depending upon the degree of tentativeness and of empirical confirmation—and these in turn are woven into *theories* of greater or lesser comprehensiveness.

Most of the major theoretical efforts in the psychology of the past climaxed by developing into backbones of *schools* or *systems*. Such a development hinges upon claims of universal applicability of the underlying theoretical principles and leads to their expansion over wide areas of psychology. This process is frequently characterized by an emotional investment that in itself seems sufficient explanation for the strong assertive emphasis usually associated with schools. Theory then becomes a powerful propagandistic policy making agent directing

future research activities over and above its original synoptic function.

The chief difficulty of schools lies in the fact that they usually are inseparably entwined with the specific character of the *field* of research in which their major theories or principles were originally developed, and that none of the principles suggested has so far positively proved its worth in carrying the full explanatory load imposed upon it by its exponents. Attempts to generally subsume the functioning of behavior under the phenomenon of conditioning (as in classical behaviorism), or under the phenomenon of closure of perceptual patterns (as in Gestalt psychology), may serve as illustrations. The maturing psychology of the present tends somewhat to de-glamorize the youthful enthusiasm, singleness of purpose, and the search for ultimates inherent in the founding of all-inclusive schools, leaving room for a multiplicity of quasi-basic principles and thus paving the way for an integration of schools into a unified family of parallel fields and functional principles.

Contemporary schools of psychology. Among the numerous major and minor trends, the following stand out most clearly at the beginning of the twentieth century: *functionalism* (Dewey, Angell, Carr) and *behaviorism* (Watson) as the major American movements, with distinct roots in England (Darwin) and Russia (Pavlov, Bekhterev), respectively; and *Gestalt psychology* (configurationism; Wertheimer, Köhler, Koffka) and *psychoanalysis* (Freud), originally in Continental Europe, but now likewise chiefly represented in America, and thus contributing to the present day convergence of all schools into a more solidified common enterprise.

All these schools have been described as revolts against the ruling psychological school of the nineteenth century, *structuralism* (Wundt, Titchener), some of them objecting primarily against its subjectivism ("introspectionism"), others against its bit-by-bit approach as represented primarily by such "atomistic" concepts as sensation and association.

The chief aim of behaviorism is to establish a psychology exclusively on the basis of "objective"—external or physiological—observation undertaken in the manner of the physicist. Thus psychology would be freed from the uncertainties of introspective observation, or sub

jective, "private" experience, which was the traditional method of psychology up to the end of the nineteenth century. A sizable number of more specific concepts or theories, such as those of the conditioned reflex, of the preponderance of environment and learning over heredity and maturation, etc., are more or less incidental, yet important characteristics of behaviorism.

The chief aim of Gestalt psychology—something anticipated by structuralism's major nineteenth century rivals, *act-psychology* (Brentano) and the psychology of William James—is to expand the scope of investigation, especially also of introspection, so as to embrace the meaningful units of experience ("phenomenology") or of behavior in their entirety, so that getting lost in insignificant detail and losing sight of the dynamic "field" context may be avoided.

At present there is a trend to weld these two basic tendencies in modern psychological development, the one toward objectivity and the other toward an adequate level of complexity, into a unified, new psychology. Conceptually most articulate among the many manifestations of such a convergence is *molar behaviorism* (Tolman) which endeavors to avoid the "molecular" inclinations of classical behaviorism as well as the lingering preoccupation with introspection of the gestaltists, incorporating at the same time features of functionalism.

Whereas both behaviorism and Gestalt psychology are in the "academic," experimental-theoretical tradition, functionalism and psychoanalysis stress problems of adjustment and thus try to encompass close-to-life features of behavior and their practical implications. The former specifies primarily in the tradition of evolutionary utilitarianism and expands in the direction of applied and comparative psychology, whereas the latter is in close touch with the outlook of psychotherapy.

In an effort to systematically classify theories and schools, the following three categories will best serve as guiding aspects: (A) their clarity as given by the degree of "formalization," (B) their frame of reference in terms of concentration upon variables in certain areas, or "regions," of observation and/or of inference, and (C) their "level of complexity" and its adequacy or inadequacy in the general framework of psychology.

(A) *Explicitness of theorizing. Intersubjectivity and Formalization.* The standards of "objectivity" for direct observation have repeatedly been stated to consist in "intersubjectivity," "lack of ambiguity," etc., and are best exemplified by the operation of pointer-reading and other cases of observation of spatio-temporal point coincidences. Similarly, in theory construction it seems to be possible to work with a system of symbols, or a "language," which is completely clear, i.e., which for all persons concerned, and for each person at different times, leads to identical results once the premises have been unambiguously stated and accepted. In such a case, one may speak of the "public" character, or the inter- and intrapersonal univocality, of construction and communication. The content of theorizing may be brought into the open and made precise to various degrees. The following major instances may be distinguished.

(1) Highest internal consistency of the kind described is achieved through the use of mathematics or, to an even greater extent, of symbolic logic. In this case one may speak of *formalized theorizing*. The farthest advance in this direction so far is Hull's "hypothetico-deductive" theory of rote learning in which the classical schema of association by spatial or temporal contiguity—to which the behavioristic schema of conditioning is conceptually related—is used to establish a system of postulates and derived theorems in the fashion of axiomatic geometry, to be checked against reality by experiments and revised if necessary.

Contrary to widespread belief, quantification is not an essential requirement in the establishment of utmost rigor in the above defined sense. In consequence, along with symbolic logic, such other purely relational, non-metric branches of mathematics as topology have also been used in the formalization of psychology, primarily by Lewin. Existing vaguenesses in topological psychology are mainly due to the insufficiency of the rules for the reality testing of hypotheses or predictions rather than weaknesses in the texture of the theory itself.—In statistics, an example of a non-metric yet mathematical procedure is ranking.

On the other hand, the frequently encountered merely programmatic employment of mathematical symbolism, such as in expressing, say, performance as a "function" of both stimu-

lus and motivation— $P = f(S, M)$ —will give only the external semblance of formalization unless the concepts entering the statement have been rigorously defined. And it will, aside from this, remain without much value unless the functional relationship has been stated with some degree of specificity.

(2) In a second, somewhat less rigorous, case, to be called *technical verbalization*, either more or less artificial terms, such as conditioning, are introduced, or common terms are vested with a new meaning by more or less arbitrary redefinition. The major emphasis is in this case usually on the definition of concepts, whereas theory construction and derivations are mostly of shorter breath than in formalized theorizing. Definitions themselves are often in terms of common language elucidation (as is, by the way, often enough the case with such so called "undefined concepts" as, e.g., "syllable exposure," "reaction," "stimulus trace" in Hull's formalized theorizing). Yet, a great deal of precision may be obtained by this technique especially when the terms are taken from the "thing language" (Carnap). There seems less danger of losing sight of meaningful content in the process of theorizing, such as often seems to accompany exalted rigor.

Examples from physics of technical redefinition are the intramural usage of "work," "clock," etc. In psychology, technical verbalization can be found at its best in molar behaviorism, especially in such fundamental instances as Tolman's "operational redefinition" of "purposive behavior" as "persistence through trial and error, and docility, relative to some end." As in the case of the concept of "work" in physics, the psychological concept of purposiveness is thus stripped of its introspectionistic and finalistic (vitalistic) connotations. At the same time a descriptive criterion is given for the testing or verification of any statement made about the presence or absence of purpose in the new, behavioristic, sense, in any instance involved. Furthermore, the fundamental principle of "vicarious functioning" is incorporated into one of the most basic, if not the most basic, notions in psychology. (This principle, by the way, has also been introduced by Hull in his earlier work on the "habit-family-hierarchy" but fell into oblivion after he turned to the more molecular enterprise of formalization.)

Yet, as in such common instances of technical

verbalization as law making by legislative bodies, there is seldom enough precision to render interpretation unnecessary. One of the few notable possible exceptions to this is Krichewsky's behavioristic redefinition, so far primarily applied to animals, of a "hypothesis" as a sequence of choices that is different from a chance sequence. Statistical criteria of significance might be applied to ascertain such a difference. Furthermore, there are few even among those introducing a redefinition who are able to keep the new technical meaning constantly in mind without slipping back into other technical or colloquial meanings of the term. (The use of subscripts to designate technical usages of terms has sometimes been suggested but so far seldom been carried through consistently in conventional write-ups.)

On the other hand, the hidden connotations and the accumulated apperceptive mass of terms loaded with tradition may often establish ties of meaning that will in the end greatly stimulate thought over and above the purely technical machinery to which proceedings otherwise might become limited. Although more mature disciplines may be able to afford to renounce such intuitive sources of progress, psychology in its present stage, with but few of its inherent problems explicitly stated, may do better not to dispense with this important life line. Thus for the sake of historical continuity operational redefinition of traditionally mentalistic terms may often be preferable to the coining of altogether artificial terms.

(3) The use of terms directly borrowed without redefinition from the vocabulary of every day life, to be termed *colloquial verbalization*, plays a decreasing role in modern psychological thought. Not long ago, however, a technique often employed in philosophy, that of attempting to "clarify" (rather than redefine) the meaning of a common term has been widely employed in introspectionism, e.g., in deciding whether sensations were "intentional"—i.e., pointing to an object outside themselves—or merely static contents of the mind, whether "orange" was a composite or a simple sensation, what was "immediately given" in experience and what was "mediate," whether or not there was such a process as "imageless thought," etc. Intuitions concerning the essence of language, of insight, or of a rejected minority group, fall in the same category.

Excursion on *level of abstraction*.—An aspect of special interest in this context is the development of what may be called the level of abstraction of concepts employed in psychological theorizing. The issue may be exemplified in the history of physics by the shift of the theory of the elements from concrete substances of daily observation, such as water or fire, to the highly abstract, often hardly visualizable constructs of electrons or wave fields. With the usual lag of many hundreds or even thousands of years, psychological theories have labored along the same path. For example, the "faculties" underlying the "phenology" of Gall more than a hundred years ago are nothing but hypostasized daily activities, such as hope, speech, calculation, or imitation. In neo-facultative modern factor analysis, as developed especially by Spearman and Thurstone, the factors are the end product of a fully formalized system of derivation from test results and their statistical correlations. These factors emerge as purely mathematical constructs, and it is often very difficult to "name" them, i.e., to relate them to directly observable activities or even abstract features of such activities.

The theory of psychoanalysis which deals with the subject of motivation, a topic even more complex and subtle than that of physiognomics or intellectual abilities directly subsumable under the "reality-principle," has just recently started on this road of emancipation from the concrete. In its beginnings at the end of the last century, first one of the major of the directly experienced as well as outwardly manifested instincts, sex, was assigned a basic role by its founder, Freud. When Adler substituted the drive for mastery and social prestige as an alternative basis for reduction of a wide variety of observed strivings (including certain aspects of sex), it seemed like a revival of the water vs. fire alternative in ancient Greek natural philosophy. Very soon, however, it was made clear that the term "sex" was to be used in a redefined, broadened sense whereby the term "genital" was to take over the narrower function of what was colloquially called "sexual." The concept of "libido," especially emphasized by Jung, and designating a generalized vital urge, is an example of an artificially imposed term that at the same time led further away into abstractness. (In spite of such and other important differences, the schools of

Adler, of Jung, and of others differ primarily in content or technique rather than in basic theoretical texture from that of Freud and are therefore not especially considered in the present article.) It seems quite likely that in the future all concrete concepts used in preliminary theorizing on personality dynamics will give way to truly formalized constructs in the fashion of modern factor analysis. It may be expected that in the course of such a development many of the misunderstandings and endless controversies, as well as a good deal of the emotional resistance that so often arises against revolutionary statements made in terms of the common language vocabulary, will be mellowed and will eventually disappear. Needless to say that observational exactitude and statistical caution are apt to increase in parallel with the adoption of objective criteria in theorizing and a formalized set of concepts and assumptions.

(4) This side remark on level of abstraction leads us back from the primary emphasis on concepts characteristic of the various stages of informal verbalization to problems of the assertive content of theorizing. Due to the flexibility of the meaning of common terms, hidden assumptions or prejudices are apt to slip in unnoticed. In this case we have *unverbalized, implicit, theorizing*. In the development of psychology accusations of the presence of such "tacit presuppositions" play quite a prominent role in the struggle of new against older schools. Probably the best known instance is that of the "constancy hypothesis" which, according to Gestalt psychology, is tacitly inherent in many of the policies or specific assumptions of structuralism. According to this supposed hypothesis each isolated stimulus element impinging upon the sensory surface of an organism will—at least within each specific sense department—at first elicit an effect in consciousness that is univocally correlated to the character of the stimulus, e.g., a large retinal image the impression of largeness in strict proportion to the size of the area stimulated.

Inadequacy in the treatment of the pre-conscious, physiological interaction and organization of the perceptual field, such as of the tendency towards "good" figure, or of the perceptual thing-constancies—establishing correctness of judgment about, say, object size regardless of distance rather than about the size of the peripheral retinal projection—has been held

against the constancy hypothesis. It is being pointed out that its roots lie in the confusion of the actually observed "phenomenal" experience with the mosaic-like "functional" anatomy of the peripheral sensorium, leading to a false molecularism in introspective as well as eventually also in functional psychology. If all this had been made explicit, it is said, such an assumption would never have been made in earnest. Implicit hypotheses thus apparently may be much more harmful than explicit ones, quite aside from the element of irrational or wishful thinking that may enter into them.

(B) *Regional reference.* It seems that implicit theorizing has its best chance whenever explicit theorizing is programmatically discouraged. The best example is early behaviorism with its overt hostility to theory, rationalized as a wish to limit psychology to "fact" and thus to avoid the discord contained in traditional informal, speculative, "medieval" theorizing. Not only has this attitude been very short lived, giving way to elaborate formalized theorizing, but—what is more—an analysis of the research policies of classical behaviorism reveals the presence of an unusual number of un verbalized biases, which make a good case for Goethe's statement that "any fact is in itself theory." One of the most important of the prejudices inherent in behaviorism is its *peripheralism*, which may be rationally reconstructed as the implicit belief that what is important in the life and behavior of an organism can be found and identified at its surface—apparently because of the fact that that is the portion which is most conveniently observable—thus rendering theoretical construction of what Tolman has called "intervening variables" unnecessary. A long series of frustrations marks Watson's search for "the" organ of learning, first among the organs of the sensory, then of the motor periphery. Only the hard way, by experiment, and in the course of the resulting reorientation toward a molar behaviorism by Tolman and by Lashley is the "generality" of animal learning, the vicarious functioning of sensory as well as of motor cues or departments, and with it the *central* basis of orientation and the prime importance of the brain, being made clear.

By the same token, and in line with the spirit of functionalism, the actually-achieved environmental end-results of a behavioral unit (e.g., the actual reaching of food) becomes one of

the most important focal regions of observation. Result-variables of this kind are a special case of what recently is sometimes called a *distal* variable (Heider, Brunswick). It may then be said that the peripheral, sensory-motor unit of the glandular or muscular reflex is in both Tolman and Hull (in the latter only in his pre-formalization phase) being overshadowed by a central-distal outlook.

From the concept of implicit theorizing it is only a short step to a discussion of such major movements in psychology which, in spite of the employment of often very high powered theoretical procedures, are characterized by the absence of that aggressive or propagandistic superstructure which would make them schools in the traditional sense of the word. Yet, by virtue of a relocation of the focal regions of interest, as well as of other changes in basic research policies, some of them are as revolutionary as their more vocal competitors, or even more so; such movements may thus well be called "implicit schools." In line with a general reluctance to indulge in open theorizing—a kind of intellectual puritanism—implicit schools are found most prominently in America. The functionalism of the turn of the century has often been said not to be a system in the customary sense; yet this is due not so much to a lack of explicitness but rather to the fact that functionalism embraces a variety of heterogeneous movements which had joined forces against structuralism. Truly implicit schools have not even gone to the trouble of finding a label for themselves which would characterize them as an "ism." Identifiable merely by the names of their most outstanding representatives, the following three stand out within academic psychology: Lashley, Thurstone, Murray. Along with such explicit theorists as Tolman, Hull, or Lewin, they have probably exerted the strongest influence in the current reorganization of actual psychological research policies, at least in America which is at present the center of psychological work.

It is significant of the *convergent trends in present day psychology* that, with all of the existing differences, the work of the leading psychologists just mentioned, possibly with partial reservations in the case of Hull and of Lewin, can be subsumed under the above formula of a shift from peripheral to a more *functionalistic, central-distal emphasis*.

In the case of Lashley, the emphasis on the central region which Tolman introduces by inferring "intervening variables" such as "purposes," "hypotheses," etc., in new, operationally redefined versions, is found in such observational directness as to be acceptable without ambivalence even to the traditional behaviorist. The only direct approach to the central region is the physiological. It is through experimental brain-lesions in rats in the case of Lashley. This approach is radically different from the sensory technology, or the sensory-motor reflexology, of the structuralists, or of the early behaviorists, respectively. The genuinely psychological character of this work is given by the fact that, just as in the case of Tolman, the central variables—such as extent of cortical lesion—are linked to, or correlated with, the reaching of a certain characteristic end state, such as the arrival in the food compartment of a complex maze.

Lewin's foothold in the region of behavioral results is somewhat doubtful as far as his theoretical system is concerned; all his real emphasis centers on inferences concerning, and the intrinsic lawfulness of, the central region, *per se*. The Lewinian "life space," which refers to the internal setting of the stage for action after perception has taken place, is conceived as a dynamic "field" rather than a conscious reality. This is an important step toward objectivism, although it has been pointed out that much of Lewin's rather casual technique of inferring the life space may in fact be "phenomenological" in the introspectionistic sense. As is conscious experience, the life space, being segmented into macroscopic units, is ideally describable in terms of a non-metric topology (see above) and Lewin is to be credited with the fact that he is the first and so far the only major psychologist to attempt the use of this happily non-quantitative yet mathematical instrument. Given the limitation of scope inherent in this comparative encapsulation into the central layer—which has definitely to be considered a molecular feature—it may be relatively simple for Lewin to develop psychological laws, especially if supported by a somewhat unscrutinized side glance at overt behavior as a testing ground for the predictions made.

Whereas Lewin, with his primary emphasis on central field dynamics, reveals his direct descent from Gestalt psychology most

clearly, both Lashley and Tolman may be looked upon as those most evenly balancing behaviorism and Gestalt psychology into a new synthesis of these two major schools. Likewise, it is in Tolman and Lashley that the functionalistic component, represented by utilitarian result-emphasis, becomes most prominent. Hull's espousal of intervening variables and of the concept of molar behavior may help to illustrate his tendencies toward, and emphasis on, central processes.

Thurstone's functionalistic leanings on behavioral results are revealed by his start from test scores. In counterdistinction to most other testers, however, he does not consider the mathematical evaluation of such results in terms of correlation or factor analysis merely as a more economical description within the distal layer. By ostentatiously adopting the much scorned tradition-loaded term "faculty" as an alternate to the neutral term "factor," he clearly puts the emphasis on the central layer of abilities and dispositions. And by the strict formalization of the rules of inference of the central factors from the distal test-scores he sets an unparalleled example of exactitude in the theoretical establishment of intervening variables. For this reason, as well as probably for the minimum display of an explicit school-superstructure, Thurstone shares with Lashley the probably least ambivalent acceptance of his particular style of work in spite of the fact that Thurstone freely indulges in theorizing of an inferential kind.

Whereas up to this point the synthesis was of behaviorism with functionalism or with Gestalt psychology or both, Murray may be considered as the academic psychologist who has gone farthest toward an integration with psychoanalysis. The emphasis on the central which he shares with all the other contemporaries listed, takes in him the form of an emphasis on "needs." As in psychoanalysis, the center of gravity is thus placed on forces of motivation assumed to be relatively stable whereas in Tolman and Lewin it is more the fluid, short-range changes of motivation that absorb most of the interest, and in Thurstone it is primarily the cognitive rather than the motivational side of the relatively permanent pattern of dispositions that absorbs the bulk of attention. The shift from the peripheral to the distal variables is reflected in Murray's emphasis on the "effects"

of behavior rather than the "actones" which constitute behavior when viewed as it issues from an organism. As is psychoanalysis, Murray's system of needs and its environmental conditions as well as consequences is one of the least formalized and thus most severely criticized. As does psychoanalysis, however, it probably contains the seeds for a system more comprehensive in scope than are those based more exclusively on the academic tradition, exemplifying once more the inverse relationship that exists—at least during the adolescent period of a science—between methodological perfection, on the one hand, and adequate complexity, on the other.

Generally, the most fundamental regional difference between academic psychology and psychoanalysis is the former's preoccupation with "geographic" environmental relationships, the well-known stimulus-response schema, whether the stimulus be "proximal" (peripheral) or "distal" (including the social). In contrast to this, psychoanalysis endeavors primarily to discover relationships of present motivation to certain focal regions along the "historical" axis, mostly the remote past, including especially early childhood. Recent academic emphasis on motivation as an experimental variable (Tolman and others), on "operant" (spontaneous) as contrasted with "respondent" behavior (Skinner) will in the end help to close a gap that should be recognized as one of divergent interest in wide open spaces rather than as one of conflicting views on a crowded common battleground of research.

(C) *Level of complexity and closeness to fact.* After discussing primarily some of the formal aspects of theorizing, such as explicitness, the aspect of the material content of a theory was brought into the picture so far primarily under the heading of differences in regional emphasis among the various schools. Other aspects of content are primarily those of scope, or level of complexity (molar vs. molecular outlook) and certain allied methodological problems (such as primarily experiment and "law" vs. statistics). These aspects can conveniently be called to attention in close connection with still another formal aspect of theorizing, namely that of the relationship of theory to the factual reality of observation. This shall be done here under the heading of "close-

ness to fact" of a theory. The following major instances will be distinguished: (1) surface theories, maintaining the observational level of complexity, and (2) dynamic (explanatory) theories of both the (a) subordinate, mediational and (b) the superordinate, functional type, characterizing a more macroscopic and a more microscopic level than that of the original sequence or co-existence of observations.

Some theories are close to what is customarily called a pure "description" of fact. The simplest way of describing facts is by *enumeration*. In this case, however, facts remain unrelated to one another and no predictions can thus be derived from them. Therefore, this approach is often considered to be outside of what is usually understood to constitute "science"; and it does not contain any element of theory, although a formalized "language" may be necessary to establish it.

(1) Theory begins with synopsis. But it is only in idealized cases, exemplified, say, in geometry, that description can truly be said not to go beyond the fact. A good illustration is the description of a circle or any other line by an equation, as is done in analytic geometry, instead of by an enumeration of all of its points. But whereas in geometry the number of points is infinite, in any empirical science only a finite and often very limited number of points is available. Synoptic description in this case becomes the fitting of an idealized continuum of points to a discontinuous series of points. In accepting the fitted curve as an alternative description one thus already transgresses the facts available; the points "interpolated" between the existing data, as well as especially those "extrapolated" beyond the ends of the observed series of points, contain an element of prediction, stated in terms of what amounts to a "law," which definitely oversteps the boundaries of a purely synoptic alternative to simple enumeration. Yet, when compared to other instances of theorizing, curve fitting stands out as singularly non-interpretative and lacking in dynamic implications, unless of course the character of the curve is taken as a starting point for further considerations, comparisons and reductions. Thus "phenotypical approach," or "phenomenological theory" (the term here not in its introspectionistic meaning), "empirical theory," "descriptive theory," or *surface theory* would

seem to be appropriate labels for synoptic description.

Most outstanding examples of curve fitting in psychology can be found in the experimental psychology of learning and of forgetting (with the logarithmic curve as a favorite), as well as in other more strictly developmental fields. The most comprehensive approach of this kind was recently undertaken by Woodrow in an attempt to find a "generalized quantitative law" for a wide variety of fields in psychology including learning, psychophysics (as an alternative to the earliest genuinely psychological quantitative law formulated, the Weber-Fechner law), the development of intelligence, and others. In combining two hypothetical factors, one for the ceiling inherent in all human performance, the other representing what might crudely be labeled sensitivity, Woodrow went somewhat beyond a mere synopsis, in the direction of underlying dynamics, but he himself regards his attempt as a surface theory. Being an exponential function with a large number of parameters which vary from application to application—in contradistinction to the "universal" physical constants, such as the speed of light, which remain the same in a wide variety of contexts—Woodrow's formula can be fitted to an extremely wide range of curve shapes, thus reducing the value of synopsis which would seem to lie in comparative specificity. There can be no doubt, however, that this kind of theorizing has a place and a future in psychology.

Another frequently used instance of synoptic description is the correlation coefficient and related measures of concomitant variation of variables. As are the mathematical functions mentioned above, correlation coefficients are abbreviated, comprehensive—although not complete—descriptions of sets of points in space, in this case determined by the frequencies over the cells of a two-dimensional scatter diagram. Contrary to frequent, often tacit misuses in practice, a correlation coefficient does not indicate direct causal relatedness of the two variables in question and is therefore just another instance of a theoretical construct to be subsumed under surface theorizing.

(2) Whenever the genotypical, conditional-genetic approach involving generalized "nomothetic" (i.e., law-asserting) statements about cause and effect is involved one may speak of

dynamic theories. More broadly, the term may also be applied to assumptions about individual, "idiographic," cause-and-effect sequences without reference to lawfulness. Although most textbooks explicitly warn against confounding observed correlation with causation, few rules are given for the methodical determination of cause and effect sequences. There can be no doubt, however, that in the end all such statements are based upon the observation or application of some kind of empirical correlation. Two major ways seem to be open: (a) by the use of statistics, gathering and combining observed correlations with only imperfect control over remaining relevant conditions, along pathways prepared by partial and multiple correlation or related techniques; none of these techniques have, however, yet been developed to an inclusiveness which would guarantee causal analysis of a foolproof nature. Or (b) by the use of the classical type of experiment, rigidly controlling all relevant conditions and observing concomitant variations of the one (or few) remaining ones. Most of the laws formulated in physics, and some stated regularities in psychology have been established in this latter fashion. In the field of personality and individual differences, however, only limited controls are possible and statistical methods, including the above mentioned factor analysis, have been more successful. Many statements of causation in this and other fields have been left to informal or even un verbalized theorizing often labelled "intuition," "understanding," and the like, which upon being made explicit would most likely reveal their character as a statistical theory, though most likely lacking in sufficient scrutiny with respect to sampling, separation of issues, etc.

There is a close relationship between dynamic theories and what is customarily called *explanation* of a fact or an observed regularity. To remove any semblance of a fundamental cleavage, explanation has sometimes been called "added description," in the typical case through reference to generalized evidence stated in the form of a sometimes more, sometimes less rigorously established law or regularity. There are two major usages of the term "explanation" in psychology.

(a) Most specifically, it is applied to a tracing of a chain of cause and effect through many, and in the ideal case through all, the

intermediate stages that lie between the originally observed coexistence or succession of facts. Quite frequently observation of such intermediate stages is impossible and systematic principles of a lower level of complexity, but usually of higher generality, often called micro-laws, are called upon to substitute for historic-geographic observation on the spot.

In colloquial terms, such tracings attempt an answer to the question "How does it work?" and the assumptions adopted, idiographic or nomothetic, may therefore be called "how-theories," "technological theories," "micro-theories" or, preferably, *mediation theories*.

Generalized mediation theories play an outstanding role in psychology, and can be found in their purest form in the theories of vision and audition developed ever since the middle of the last century by Helmholtz and others. They are based on observations of gross correlation between such stimulus variables as wave length of light or sound, on the one hand, and of psychological response qualities such as sensations of color and tone and their attributes, such as hues, subjective pitch and loudness, etc., on the other. Unresolved alternatives, such as those existing among the resonance theory, the telephone theory, or the volley theory of the functioning of the ear and the auditory nerve, occupy the interest of psychologists up to the present. Their counterparts in the field of vision have, without being completely settled, already faded from the attention of psychologists into the domain of a more molecular discipline, physiology. Many other mediation problems may ultimately become relegated to such more "fundamental" sciences.

Mediation theories of much broader scope have recently been developed to explain features of behavior which themselves span a considerably wider range than those existing between proximal stimuli and peripheral excitations or central sensations. The most outstanding example is Hull's theory of behavior, a sequel to his work in formalized theorizing mentioned earlier in this report. Hull tries to fill the gap between the geographical stimulus-environment existing at a certain moment, on the one hand, and the accomplished behavior act, on the other, with a chain of inferred links, combining the Pavlovian schema of conditioning with the Thorndikean principle of reinforcement through the law of effect (satis-

faction of drive). This schema, emphasizing past experience (or past behavior) as has English associationism and later structuralism, is, however, only one of two major alternatives. The opposite theory is one of internal field dynamics, more specifically, of the closure or completion of incomplete patterns—which include unsolved "problems" along with the originally studied incomplete geometrical patterns which perceptually tend to become "better," more regular, symmetrical, simple, in short, "prägnant"—through the intrinsic laws governing the interplay of forces within the "closed system" of the organism. Various forms of such a theory have been proposed by Gestalt psychology and related movements, such as the Würzburg school of Külpe, Bühler and Selz. The association and completion theories have in common that they are phrased in terms of intervening variables, and sometimes even in quasi-physiological terms, by the use of such "unobservables" as excitatory or inhibitory potential, brain field, etc., and only indirectly in terms of the environment. It is for this encapsulation within the organism that both of these theories have to be classified as mediational. (The same holds, by the way, for the highly mathematized theories of Rashevsky and his collaborators.)

There remains, however, an important difference that characterizes the association theory as more "molecular" in comparison with the completion theory. In the interpretation of the Gestaltists the association theory, being patterned after the model of the reflex arc, or of a telephone switchboard system, is a "machine theory," whereas the completion theory is dynamic in a more genuine sense of the word by its emphasis on free interaction of energy within large areas of the nervous system. The basic conception of "mass" functioning of the nervous system as developed by the modern behaviorist, Lashley, or by the biologist, Paul Weiss, is in accord with such a field interpretation. Under this aspect Lashley, along with Tolman, has to be classified as a molar behaviorist whereas Hull retains some characteristics of molecular behaviorism in spite of an attempt to introduce several specific molar features into his behavior theory, such as "stimulus patterning," "behavioral oscillation," etc.

(b) Given an observed macroscopic causal correlation of two variables, one may, as an

alternative to mediational theorizing, attempt to see their connectedness as embedded within an even broader causal texture. In want of a fully established term one may label efforts of this kind *functional theories*. Comparing the two approaches in terms of analogies all of which are somewhat inadequate, mediational theorizing may be said to correspond to mathematical interpolation, functional theorizing to extrapolation, or the relationship may be said to be similar to the one of technology to economics, or to the one of tactics to strategy in military science. And whereas the mediationist's primary question was said to be "how?" the functionist may be said—with certain specifications—to ask "why?"

Broadest term under which behavioral activity may be subsumed as a part-function is "survival." Handed down from Darwin, it is extensively used by modern formalizers of behaviorism such as Hull, revealing functionalistic leanings, even where specific theory tends toward the mediational by stressing the (quasi-) physiological as contrasted to the more broadly "biological" aspects of adjustment. Such somewhat unorthodox appendages to behaviorism as Thorndike's law of effect, or the recent emphasis on "instrumental" vs. "classical" conditioning reveal present trends toward functionalism within behaviorism. To an even greater extent this is true of such concepts as Tolman's operationally redefined "purpose" (see above), or the wishes and needs of psychoanalysis or of Murray, especially when stress is also placed upon a satisfying condition in the physical or social environment. The essential step in this respect is the introduction of the actually accomplished behavioral results as remote and sometimes purely environmental distal variables, along with those of a physiological or stimulus nature.

Generally, a functionalistic theory can be considered the viewing of an event as suspended between two "foci" for which a correlation has been established previously. One of the clearest examples is given when a specific habit, say, the running of a rat through a door, is seen as a part, or as one of many possible over-all manifestations, within the framework of a habit-family-hierarchy (to come back to the term of Hull). The antecedent or initial focus of such a complex behavioral unit may be a state of physiological need, the consequent or terminal

focus may be the actual arriving at the place where food can be found. In between lie the variety of habits, means, or instruments through which the correlation of initial and terminal focus is being mediated at various occasions, in "vicarious functioning" of the various instruments.

The most controversial feature of functionalistic theories is the relating of an instrument to the terminal focus so that its role as an "instrument" becomes "response inferred" (the term by Spence). More concretely, this would be the case if it were stated that a rat runs through a gate "because it wants to get to the food" or that a person leaves town "because he wants to get away from his parents." Such formulations have been severely objected to because of the teleological associations connected with them in the history of psychology. But actually, as becomes especially clear in Tolman's redefinition of "purpose," such a formulation need not mean anything but the purely descriptive reference to the fact that running through a gate has in the past frequently been observed to result in an arriving at food, and that running through the gate has at the same time been observed to be one in a series of events in which the animal proved to be "persistent and docile through trial and error," with the reaching of food being the crucial condition for quiescence.

It is a question of terminology as to how far reference to a "wish" or "purpose" in terms of a terminal focus can be considered "explanation." It would certainly be accepted as such in conversational language. Most of the theories in psychoanalysis are of this type, not to speak of such entire disciplines as economics, in which automobiles may be considered to run because there is a demand for transportation (functionalistic macro-theory) rather than because it contains cylinders, gasoline, wheels, etc., in proper arrangement (mediational micro-theory). Psychologists brought up in the tradition of the exact molecular natural sciences may be reluctant to accept a why-theory, or they may at least request a "whence"-theory (referring to initial focus, or cause), if not a how-theory, in preference to a "whither"-theory of the kind just described (referring to a terminal focus, or probable effect).

Reluctance in this respect may only partly be due to the teleological nature of functional

theories; another strong reason seems to be given by the fact that the more wide spanning a correlation, the less it is apt to reach the univocality usually requested of a "law." Examples for this may be taken from correlation statistics ever since its inception (Galton, Pearson), with its early preoccupation with problems of heredity of physical or mental characteristics, or from psychoanalytic theories asserting that adult behavior in many instances may be explained as a substitute or symbolic fulfillment of wishes thwarted in early childhood. No more than statistical correlations could at best be obtained between initial and terminal focus of such patterns, with most of the intervening variables beyond the reach of controls other than those by broad class-membership (e.g., "normal" environment or physical development).

Still more fundamentally: Such controls should not even be applied if it were possible to do so since the maintenance of relatively stable long-distance relations in spite of variable mediation seems to be one of the major characteristics of life. So much so that various forms of stabilization models have been laid down—often by behaviorists concerned with the delimitation of the field of psychology as a whole—as the chief objective criterion of behavior vs. non-behavior. This is already quite explicit in such classical-behavioristic analogies as A. P. Weiss's raindrop-analogy or Hunter's principle of vicarious functioning, and it is furthermore inherent in Tolman's above mentioned definition of purpose (with a predecessor in McDougall), Hull's habit-family-hierarchy, Lashley's equipotentiality of brain areas, Murray's irrelevance of actones, Freud's symbolism and other mechanisms such as displacement, sublimation, etc., likewise belong here. Analogous "lens-models" (Bunswik) have been suggested in the psychology of perception (thing-constancies). Even in physiology, stabilization mechanisms, such as the principle of homeostasis (constancy of the internal milieu, e.g., of blood temperature, in spite of changes of external conditions, activity, etc.) as emphasized by Cannon play an outstanding role.

Explanation or not, terminal reference as theory in the sense of "added description" can hardly be objected to if it is made clear that the realm of previously observed fact is not being transgressed and that a mediational ex-

planation is not being attempted except possibly as a probability statement.

A special mediation problem: *mechanism vs. vitalism*.—A problem sharply to be distinguished from those discussed so far is terminal reference as an absolute "ultimate," i.e., as an explanatory principle sui generis. Ever since Aristotle's entelechies the vitalistic notion of a "final" causality superimposed upon physical causality has remained an issue in psychology. The alternative to vitalism is mechanism, i.e., the assumption that all facts of life, including goal-strivingness as a descriptive phenomenon, can in the end be reduced to, or subsumed under, ordinary physical laws. Actually, this problem is not a functional but a mediational one. In order to decide empirically the mechanism-vitalism alternative one would have to go into extremely minute detail of the mechanism of heredity, restitution, or regeneration, or of the physiological happenings at the time of choice between alternative behaviors. It would involve a checking upon conservation of energy of extremely minute quantities. It is thus that the problem has recently become entangled with those of the quantum physics of the atom, whereby some theorists have attempted to reintroduce the vitalistic principle of freedom of will through the indeterminacy or alleged statistical, unpredictable nature of the processes within the atom. Any possible settlement of the mechanism-vitalism problem is utterly beneath the order of magnitude of the processes with which even the most molecular psychologist is concerned. Regardless of whether one violently espouses mechanism, as was done by Watson, or vitalism, as was done by McDougall, the decision was dogmatic; more recent thinkers such as Tolman therefore do not refer to this problem at all, apparently considering it permanently shelved as far as psychology is concerned (although they privately may believe in an ultimate resolution of macroscopic behavior patterns into processes predictable in a physical manner). Logical positivists, such as Carnap, explicitly declare the problem of the unity of physical and biological laws an empirical question not to be solved dogmatically or by speculation, and unsolved so far; the unity of *method* of observation and theory construction within the realm of all the sciences being the only requirement to be fulfilled in establishing an objective psychology ("methodological physicalism").

Theories about Theories and Research Policies in Psychology.—The above discussion leads us to the various arguments that can be found throughout the psychological literature in judging the value or adequacy of certain fundamental assumptions or basic policies adopted by individuals and schools in psychology. Some of these issues have been brought up before in this report, such as the problem of objectivity, formalization, or operational redefinition. Other theories about theories deal with genetic problems of the history of science.

An outstanding recent example is Lewin's distinction of Aristotelian and Galileian modes of thought in psychology, somewhat similar to Comte's distinction of the theological and metaphysical vs. the positive stage in the development of science in general. The Aristotelian mode of thought is taken as a representative of the older philosophical or speculative approach and is most characteristically manifested by a tendency toward the setting up of "dichotomies," i.e., of absolute rather than relative distinctions between opposites, such as mind and matter, learning and insight, mechanism and vitalism, nomothetic and idiographic disciplines, etc. Galileian modes, according to Lewin, lead to the transformation of such notions into truly scientific ones, the replacement of differences in kind by differences of degree, a general adoption of quantitative methods and a discovery and emphasis upon lawfulness. In consequence, theories should be, and are in practice, judged not only in terms of their direct merit, but also more indirectly, in terms of their genetic level which in a general way may allow us to anticipate their adequacy.

To the present reviewer, the discussion about the status of laws in psychology seems of particular importance. In fact, he is inclined to advocate the replacement of the classical experiment, with its emphasis upon the discovery of strict laws, by a more statistical procedure even in stimulus-response psychology as the only practicable way to establish an exact, yet molar objective psychology. Imperfect correlation or probability laws would then take the place of unequivocal laws, although the latter most likely "exist" and can be discovered at the expense of adequate complexity.

Another issue of similar, methodological nature is the relative weight to be assigned to the idiographic, case-descriptive, "clinical" approach

as contrasted with the nomothetic, more generally law-finding (which in this alternative would include the statistical). This is a reiteration, on a more advanced and formalized plane, of the old controversy as to whether psychology in its basic orientation is a natural science dealing with generalities, or a "cultural" science (*Geisteswissenschaft*) dealing with singularities, or at least with "individuals" that have to be intuitively "understood" in terms of some—possibly self-consistent, i.e., idiographically "lawful"—personal "styles of life" peculiar to them alone.

Theoretical issues of this type may appear to stand isolated at times, yet the answers given to them form the nucleus of the fundamental philosophies of science crystallized in the various psychological systems or schools.

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BIBLIOGRAPHICAL NOTES

Only references to publications in, or translations into, English are included here. Sources for the most recent movements in academic psychology are given in somewhat greater detail, since they occupy the limelight of recent discussion and since only scant comprehensive treatments or adequate up to date bibliographical selections have appeared after the early thirties. An effort has been made to select in each case the most concise presentations available, among them quite often presidential addresses of the American Psychological Association, so that the reader may be enabled to make the best use of his time and energy in his endeavor to obtain a full view of the issues involved in modern psychological theorizing.

(1) *Original sources on schools and movements.*—The two major historical forms of nineteenth century introspectionistic psychology are most outstandingly represented in American psychological literature by Wundt's pupil, E. B. Titchener, in his posthumously published presentation and belated defense of structuralism, *Systematic Psychology, Prolegomena* (Macmillan, 1929), and by W. James, in his chronologically much earlier but in spirit more modern *Principles of Psychology* (2 vols., Holt, 1890) which shows some common elements with Brentano's act-psychology but in certain ways also foreshadows most of the later "crisis" schools, including American functionalism, behaviorism, Gestalt psychology, and even psychoanalysis.

These major movements are in their original form most clearly represented in J. R. Angell's presidential address, "The province of functional psychology" (*Psychol. Review* 1907, 14), in J. B. Watson's third and latest book, *Behaviorism* (Norton, 1924), K. Koffka's *Principles of Gestalt Psychology* (Harcourt-Brace, 1935), and S. Freud's *Introductory*

Lectures on Psychoanalysis (Allen & Unwin, 1922, originally 1917), the latter to be augmented by such indexed and glossarized *General Selections* from his works as the one edited by J. Rickman (Hogarth Press, 1937).

The formalized, physiological-behavioristic theorizing centering about learning problems reaches a climax in two books by C. L. Hull (the first in collaboration with several other authors), *Mathematico-Deductive Theory of Rote Learning* (Yale Univ. Press, 1940), and *Principles of Behavior* (Appleton-Century, 1943). Especially the latter has, in the years immediately following its publication, elicited an unprecedented amount of critical reviewing, discussion and counter-discussion, such as in the *Psychol. Bulletin* (Koch, Ritchie; on math-ded. theory: Hilgard and others), the *Journ. of Genetic Psychol.* (Leeper, Welch), the *Amer. Journ. of Psychol.* (Skinner).

More important from the standpoint of the development of a molar approach is some of the last of Hull's writing of his period preceding formalization, especially three articles on "The concept of the habit-family hierarchy" and related schemata (*Psychol. Review*, 1934-35, 41, 42). Less well known among psychologists, but no less important in the field of formalized quasi-physiological theorizing in psychology at large, and gradually working up to such complex topics as esthetic appreciation of forms, Gestalt problems, the perceptual thing-constancies, etc., are N. Rashevsky's *Mathematical Biophysics and Advances and Applications of Math. Biology* (Univ. of Chicago Press, 1938 and 1940, resp.), followed by A. S. Householder and H. D. Landahl, *Math. Biophysics of the Central Nervous System* (Math. Bioph. Monogr., No. 1, 1941), and largely based on, and augmented by, numerous papers in *Bulletin of Math. Biophysics* (beginning 1939). A less technical type of formalization of learning theory is attempted in B. F. Skinner, *The Behavior of Organisms* (Appleton-Century, 1938). For a general discussion of learning theories see E. R. Hilgard and D. G. Marquis, *Conditioning and Learning* (Appleton-Century, 1940).

Molar behaviorism of a non-vitalistic, operational kind representing a convergence with both functionalism and Gestalt psychology is first conceived by E. C. Tolman in his *Purposive Behavior in Animals and Men* (Appleton-Century, 1932), as well as in "Psychology vs. immediate experience" (*Philos. of Science*, 1935, 2) and a series of articles, many of them in the *Psychol. Review*, including one in collaboration with E. Brunswik on "The organism and the causal texture of the environment" (1935, 42), and the presidential address. "The determiners of behavior at a choice point" (1938, 45). One of the most outstanding operational redefinitions of an originally introspectionistic concept may be found in I. Krechevsky, "Hypotheses in Rats" (*Psychol. Review*, 1932, 39). An excellent presentation of the experimental evidence forcing the shift from Watson's peripheral to Tolman's central behaviorism, together with illustrations of the methodological changes involved, is given in R. S. Woodworth, *Experimental Psychology* (Holt, 1938, first half of Chapter 6). Still closer to Gestalt

psychology than Tolman is K. Lewin, *Dynamic Theory of Personality*, and *Principles of Topological Psychology* (McGraw-Hill, 1935 and 1936, resp.), continued in his still more technical *Conceptual Repres. and Meas. of Psychol. Forces* (Contrib. to Psychol. Theory, No. 4, 1938), and in "Formalization and progress in psychology" (Univ. of Iowa Stud. in Child Welfare, 1940, 16-3). Going beyond Gestalt psychology in the direction of an objective functionalism as does molar behaviorism, but centering about the perceptual thing-constancies rather than about the means-end problems which constitute their mirror image on the overt behavioral side, is E. Brunswik, in a summary of his book whose title is best translated as "Psychology in Terms of Objects" (1934): "Psychology as a science of objective relations" (*Philos. of Science*, 1937, 4; some serious errata corr. 1938, 5).

The best source for H. E. Murray's synthesis of certain elements of modern psychology and of psychoanalysis are the first two chapters of his *Explorations in Personality* (in collaboration with numerous other authors of the Harvard Psychological Clinic; Oxford Univ. Press, 1938). The ambiguous character of the need-to-effect relationship involved is stressed in E. Frenkel-Brunswik, *Motivation and Behavior* (Genetic Psychol. Monographs, 1942).

Only scant theoretical utterances are available in the case of such "implicit" school-leaders as Lashley and Thurstone. The former's "Basic neural mechanisms in behavior" (*Psychol. Review*, 1930, 37), and the latter's non-technical "The vectors of mind" (*Psychol. Review*, 1934, 41)—both presidential addresses—, as well as Thurstone's defense, against Anastasi and others, of his factors as the operational revival of the old "faculties" in "Shifty and mathematical components" (both authors in *Psychol. Bulletin* 1938, 35; see also 1940, 37), may be consulted to advantage.

(II) *Texts on schools, and other comprehensive treatments.*—The period up to the close of the era of divergent schools of psychology, i.e., roughly up to 1930, has found its terminal expression in a number of comprehensive books. Among these probably the most widely used is E. Heidbreder, *Seven Psychologies* (Appleton-Century, 1933), a clear and well proportioned presentation of the major systems on a relatively elementary level, and with an adequate selection of references to original sources up to that period which may serve as a first guide to those interested in the semi-historical literature on systems of psychology. Of similar intent but of somewhat lesser inclusiveness is R. S. Woodworth, *Contemporary Schools of Psychology* (Ronald Press, 1931). With a historical slant, and organized more about fields than schools proper, is G. Murphy, *Historical Introduction to Modern Psychology* (Harcourt-Brace, 3rd ed., 1932), with an appendix by H. Klüver on such exclusively continental movements as "intuitionism." For similar reasons, R. Müller-Freienfels' somewhat unwieldy *Evolution of Modern Psychology* (Yale Univ. Press, 1935), may also be recommended, although with reservations. First hand summaries of a considerable number of schools by their originators or by close collaborators

were assembled by C. Murchison in *Psychologies of 1925*, and of 1930 (Clark Univ. Press), among many others of such sometimes otherwise not easily accessible but important authors or movements as Sander's brand of configurationism (the Leipzig group), Russian "objective psychology" and "reflexology" in both the Pavlov and the Bekhterev versions, and Janet's and Adler's sub-varieties of psychoanalysis.

Comprehensive presentations of the developments in psychological theorizing since the early thirties are at this writing available only in the form of short articles of necessarily limited usefulness, and even these are few and far between. Almost without exception, these papers also reflect the current general trend toward a higher level of abstraction in the presentation or discussion of schools or theoretical issues. E. Brunswik, "The conceptual focus of some psychological systems" (first publ. 1939, reprinted in *Twentieth Century Psychology*, ed. by P. L. Harriman, Philos. Library, 1946) uses a considerably oversimplified, schematic presentation of the various schools in terms of regions and patterns of their research emphasis. A fundamentally similar purpose, but even more stressing systematic issues rather than schools, underlies the penetrating study by F. Heider, "Environmental determinants in psychological theories" (*Psychol. Review*, 1939, 46). The merits of J. R. Kantor, "Current trends in psychological theory" (*Psychol. Bulletin*, 1941, 38), are somewhat obscured by the author's going off the main line of current discussions. A unique survey of the changing points of view implicit in the psychological research since the closing decades of the nineteenth century is given in G. W. Allport's presidential address, "The psychologist's frame of reference" (*Psychol. Bulletin*, 1940, 37). This analysis based on careful study of the content of articles in the leading psychological periodicals may well anticipate a future development toward an objectified and statistical treatment of the history and trend of psychological ideas.

(III) *Systematic discussion*.—The recent emphasis on discussion centering about fundamental problems and basic methodological issues inherent in the founding of schools, rather than about these schools as the unifying centers themselves, is represented in such books as C. C. Pratt, *The Logic of Modern Psychology* (Macmillan, 1939), and C. R. Griffith, *Principles of Systematic Psychology* (Univ. of Illinois Press, 1943). Both these ambitious undertakings fall, however, somewhat short of their mark. The latter contains the most nearly complete list of references in theoretical psychology, at least as far as the recent American literature appearing as books or in the routine theoretical periodicals, including the philosophy of science relevant to psychology, is concerned, giving more than 1500 titles. E. G. Boring's most recent historical treatise *Sensation and Perception in the History of Exp. Psychology* (Appleton-Century, 1942), presents material or discussion relevant to systematic problems and schools of psychology (in Chapters 1, 2, 7, and 8).

In the periodical literature, the following two issues seem to emerge as rallying points in the modern type of methodological theorizing: (1) ob-

jectivity in its broadest sense, the problem of being "exact"—or "scientific"—in psychology, which is at the root of behaviorism and is most recently reflected by the discussion on operationism in psychology, and (2) the problem of keeping on an adequate level of complexity, i.e., sufficiently rich and close to life in context, scope, and content, "molar" rather than "molecular," as represented by the various programmatic trends inherent in Gestalt psychology, psychoanalysis, as well as in a good part of functionalism. Symposia have recently been devoted to each of these two basic issues.

(1) A "Symposium on Operationism" (*Psychol. Review*, 1945, 52 No. 5), with Boring, Bridgman, Feigl (shifting toward the problem of the level and generality of laws, and of explanation), Israel, Pratt and Skinner as contributors, climaxes a development of interest in "methodological positivism" that found its first comprehensive presentation in American psychological literature in S. S. Stevens's frequently quoted article on "Psychology and the science of science" (*Psychol. Bulletin*, 1939, 36) and has since achieved major proportions. It is closely related to the trends toward methodological integration of the physical with the biological and social sciences in terms of observation as well as of logical formalization advocated directly or indirectly by such contributors to the *Internat. Encyclopedia of Unified Science* (Univ. of Chicago Press, beginning 1938) as Carnap, Morris, Dewey, Russell, Woodger, Reichenbach, Brunswik and Ness. Among the numerous isolated articles on related problems we mention only two of the most outstanding and best known: G. Bergmann and K. W. Spence, "Operationism and theory in psychology" (*Psychol. Review*, 1941, 48), and the latter author's "The nature of theory construction in contemporary psychology" (*Psychol. Review*, 1944, 51).

(2) In a "Symposium on Psychology and Scientific Method" (University of Chicago, 1941; publ. in No. 3 of *Psychol. Review*, 1943, 50), Brunswik, Hull, and Lewin discuss what seems more recently to crystallize as the nucleus of the problem of adequate complexity, namely the formal criteria of behavior, the alternative of classical laws vs. statistical probability laws, and the status of the "intervening variables" as well as of the "field" concept in psychological theorizing. The classical desire to encompass psychological phenomena by one or a few fundamental laws climaxes in H. Woodrow's presidential address, "The problem of general quantitative laws in psychology" (*Psychol. Bulletin*, 1942, 39). The closely related more purely methodological alternative of classical "pure case" experiment vs. a more representative type of experiment in the study of stimulus-response correlations is answered in favor of the latter in E. Brunswik, *Distal Focusing of Perception* (Psychol. Monographs, No. 254, 1934). Indirect support for the probability conception of psychological research may be gained from such authors as the physicist, R. v. Mises, in his *Probability, Statistics and Truth* (Macmillan, 1939).

The relationship—methodological or otherwise—of academic psychology as a whole to psychoanalysis is discussed by both sides in a "Symposium on Psychoanalysis as Seen by Analyzed Psychologists" (in-

augured by G. W. Allport, in *Journ. of Abnormal and Social Psychol.*, 1940, 35). Among the eleven participants, Boring, Sachs, Landis, J. F. Brown, Murray, Frenkel-Brunswick, and Alexander (in an afterthought) represent major psychological movements or emphasize the theoretical rather than the biographical, practical, or generally the content aspect of the controversy. See also K. Lewin, "Psychoanalysis and topological psychology" (*Bull. Menninger Clinic*, 1937, 1). The widespread current trend of psychoanalysts toward emphasis on the "ego" with its "reality principle" has first been made an issue in Anna Freud, *The Ego and the Mechanisms of Defense* (London, 1937). Related to this is a stress on the actual cultural and social environment in the formation of character or neurosis by such relatively independent contemporary psychoanalysts as Horney, Fromm, Kardiner. The books of these authors as well as such comprehensive surveys as *Psychoanalysis Today* (ed. by S. Lorand, Int. Univ. Press, 1944) show the increasing convergence of psychoanalysis with the traditionally "situational" (rather than "historical" and "depth" psychological) emphasis of academic, stimulus-response psychology. That this convergence is also a methodological one is exemplified by the purpose implicit in R. R. Sears, *Survey of Objective Studies of Psychoanal. Concepts* (Soc. Science Research Council Monogr., No. 51, 1943). Another monograph in the same series, G. W. Allport, *The Use of Personal Documents in Psychol. Science* (No. 49, 1942), shows the new methodological awareness for the "idiographic" or "clinical" approach as a whole of which psychoanalysis is but one of several possible manifestations.

PORTEUS MAZE TESTS.—The Porteus Maze Tests, strangely enough, owed their development to the same kind of practical situation as did the Binet, namely, the necessity for better diagnosis and classification of mental defectives for educational purposes. In 1908 Binet and Simon published their first mental age scale, which was then brought to America by Goddard and standardized by him in 1911. Five years after Binet's publication, the writer was given the responsibility for gathering together the feeble-minded of Melbourne, Australia, and having them segregated for educational purposes into special schools. With the development of this work, especially at the Fitzroy Special School, it soon became apparent that a classification by Binet mental age (Goddard Revision) did not agree at all with the status of individual defectives as regards their practical intelligence and trainability. Involved as I was with the task of setting up a very comprehensive system for training feeble-minded girls and boys, with special emphasis on simple domestic and manual arts, the writer had excep-

tional opportunities for intimate experience with these unfortunates. After a time children were brought in increasing numbers by parents for examination, so that by the end of 1913 an active mental clinic was functioning at Bell Street, Melbourne.

In supervising the educational treatment of defectives I soon realized that lack of scholastic abilities was not their only handicap. Their social and industrial reactions seemed to be marked by very inferior planning capacity. Moreover, some experiments showed that the greater the degree of general defects, the more deficient the individual seemed to be in foresight that he could apply to useful purposes. For example, there were children so low in practical intelligence that they could not open a locked door even when the key was left in plain sight. Others were helpless when the problem involved getting a chair to obtain the key when it was hung on a nail out of their reach when standing on the floor. Still others could not carry out three step operations as when the door key was locked in a cupboard, the key of which was then hung where it could be plainly seen. Thus it will be seen that these tests were on the same order as those applied at a later period in testing the intelligence of apes.

However, these situations were difficult to standardize, and recourse was had to other methods of testing planning. Among other tests the Fernald-Healy Puzzle Box was used. In this test the box may be opened by releasing strings and rings in proper order by means of a button-hook manipulated through a hole in the side of the box, the operations being planned visually through the glass top. The test was ingenious but called for too much manual dexterity. The writer then hit on the plan of requiring the subject to plan a course between two points on a large-scale city map, and from that the obvious development was a printed maze. It may be noted that the first two designs experimented with, those for nine and ten years, resemble part of an urban map with blind streets. The designs were then extended above and below these levels.

The various studies that were then undertaken for the purpose of standardizing and validating the Maze require only the briefest mention. The first form of the scale covered the mental ages between five and thirteen years.

and the results of application to defectives were compared with their Binet scores. Agreement was generally close, but it was noted that, as subjects approached moron levels the discrepancies between the test verdicts tended to increase. However, where there were serious disagreements, reports from the manual arts instructors usually supported the Maze test scores rather than the Binet.

Early in 1914 the tentative scale was applied to a large group of deaf cases attending an institution school, and it was proved possible by its means to pick out those judged by teachers to be feeble-minded. All these defectives scored markedly below the pupils with normal mentality. After certain modifications were made, the tests were applied to a group of 120 subnormals. In 80 per cent of cases the Binet and Maze records were within one year of each other, but it was in the remaining 20 per cent with greater differences that the Maze test verdicts were of most significance. In some of these cases the Maze score proved decisive as regards differential diagnosis.

The same year the tests were first publicly described and results reported at a meeting of the British Association for the Advancement of Science, which held its 1914 sessions in Australia. In June, 1915, the tests were published simultaneously in the *American Journal of Psycho-Asthenics* (14) and the *British Journal of Experimental Pedagogy* (15). It is interesting to note that the tests have survived both media of publication.

The following year marked the first application of the tests to delinquents. A group of reformatory cases registered significantly lower performances than another group of less serious offenders resident at a boys' home. An interesting pioneer study was also undertaken at this time. Aboriginal children, mainly half castes, were examined at a mission school at Point McLeay, South Australia, and the results reported in *The Psychological Review* (16).

In 1916 there occurred an opportunity to test the standardization of the tests with normal children. The records of 190 of these were compared with the scores of 200 defectives who had been examined by the Goddard Revision. The same article reported results of testing 263 cases by Terman's Stanford Revision (17). Some results with delinquents and deaf children were also included in this publication. The correla-

tion coefficient for the mentally deficient group was .7, for 190 normal cases .69, and for 263 cases examined by the Terman revision .77. The group contained some defectives and a wide range of mental ages.

Encouraged by these results, the writer, with two assistants, embarked on what was then considered an extensive program of research. One thousand children attending rural and city schools were examined with Binet and Maze. This was one of the first studies which called attention to the differences on test responses exhibited by city and country children. Correlations at each age level were calculated, but as the range was artificially restricted these varied from .24 to .61 for boys and from .41 to .75 for girls. Some change was made in the test designs and the scale was reapplied to 1,255 cases. The results were published in 1920 (1). A similar investigation undertaken by Professor Cyril Burt in 1921 showed that with London school children the standardization of the Maze up to 14 years was reasonably correct (3). The same year marked the first study of the Maze test in a non-English-speaking country. The results of application of the test were the subject of a thesis presented by Dr. Carlos Miranda to the Faculty of Medicine in Lisbon.

At Vineland, New Jersey, where the writer took up his duties as director of research in 1919, the work of validating the tests was continued. The criterion was a number of industrial ratings of inmates of the Training School supplied by Mrs. C. E. Nash, educational director. Boys' ratings correlated .67 with the Maze, .62 with the Binet, .61 with a group of Army performance tests. Girls' ratings correlated .75 with the Maze, .66 with the Binet (18). Ross (29), in Scotland, also working with defectives, confirmed these findings as to the relation of industrial trainability to the Maze test. She found for defectives a correlation of .81, and with a mixed group of defectives and normals the Stanford-Binet correlated .69, the Maze .76, the criterion being teachers' ratings of pupils' handwriting.

The devising of a measure of social adaptability, called "A Social Rating Scale for Defectives" (19), provided another criterion against which the validity of various mental tests could be compared. A number of studies were undertaken at Vineland, mostly by Dr. Marjorie Babcock. In the first, 38 males yielded very similar

correlations for the Binet, Maze, and Goddard Form Board with the social ratings. All were about .6, but when the Binet and Porteus were averaged the correlation with the criterion rose to .73. For 44 females the Binet correlated .69, the Goddard .68, and the Maze .75. The coefficient for the Binet-Porteus average was .79. When the cases were limited to those with mental ages above 8 years, the relation of the Goddard test to social adaptability was lowered significantly, proving that the Form Board was most valid at the lower mental levels where its verdict was needed least for diagnostic purposes.

In six other studies the Binet correlations with social adaptability were respectively .32, .82, .62, .46, .85 and .60, or an average for all studies of .61. For the Maze the coefficients were .7, .81, .64, .72, .78 and .67, or an average of .72. As a significant by-product of these investigations we may call attention to the variability of the coefficients, notwithstanding the fact that all groups were mental defectives, thus proving the importance of sampling. Differences in chronological and mental ages and industrial usefulness distinguished the various groups. Perhaps the most significant study was the last carried out, in which 100 fairly typical of the feeble-minded population were examined. The correlation of the Stanford Revision with the criterion was .6, whereas the Maze coefficient was .67. These results were reported in 1923 (20).

Miss Doris Dewey also made a similar investigation, the results of which were reported in a later monograph (21). She used a variety of tests and obtained the following correlations with the social criterion: Maze .77, Porteus Form and Assembling .72, Kohs Block Design .71, Pintner-Paterson .66, Stanford-Binet .62, Goddard Form Board .63, Knox Cube Imitation .12. This study served to indicate that some performance tests have a closer relation to social adaptability and therefore to mental diagnosis than the Binet. However, a combination of Binet and Maze mental ages correlated .82 with the criterion, suggesting rather forcibly the wisdom of using the two tests in a battery. Wells (35), however, cautions against this practice of fusing scores and remarks that "in borderline Binet ratings the Porteus scores may well be decisive from the standpoint of practical disposition." He prefers to consider the test

results separately, and "to estimate the proper bearing of each score on the understanding of the case." Herd (7) also counsels dependence in diagnosis upon the verdict of performance tests, and places the Maze "in the front rank from this point of view."

Earle, Milner and others carried out studies in England (4) to determine the usefulness of various tests in vocational guidance. Their subjects were 570 children attending elementary schools in a working-class district in London, whose median age was 13 years, 10 months. The boys' median Maze score was 12.4 years, girls' 12.1 years. They agree with Burt's previous findings as to the causes for failure, listing mental confusion, failure to sustain attention, inability to follow the longer paths on the mazes with the eye, failure to remember the course planned, inability to profit by errors. Other mistakes were due to overconfidence or careless or impulsive habits of action. The other tests used in this study were the Knox Cube, the Dearborn Form Board, the Cube Construction, Goddard Form Board, both Healy Picture Completion Tests, the Binet and a group intelligence test. In regard to the use of tests as predictive measures in industrial training, the Maze correlated .61 with "passing out" examinations for "Fitters." Though it appeared unlikely that the test results would have any significant bearing on industrial ability except at rather low levels, there have been some recent studies which support the relationship, at a higher industrial range. Gibbons (6), for example, became interested in the problem of selecting foremen for an Ohio Alkali Company by means of indirect measures of personality and found that weighted scores derived from an Employee's Record Form, plus a score based on the times taken for putting on and taking off nuts on a Bolt Board test, plus the number of stops made in working through three of the Porteus Mazes, correlated .632 with superior officers' ratings, and could be used as a prediction equation.

Brundage¹ also reports the use of the Maze in connection with the selection of foremen at a Wrigley Gum factory in Chicago. The problem was to select inspectors of boxes of their commercial product, involving the handling of about 1,000 boxes an hour. There was an experimental battery of twenty tests in which the

¹ In a private communication to the writer.

Maze was included. With N98, "the highest single correlation with criterion was the Maze T. Q., with .498." The same score on the Maze (taken without the subject's knowledge) was one of the highest, with about .44. After working out the multiple correlations Brundage "wound up with Porteus T. Q., Porteus Time, Placing (Minnesota Rate of Manipulation), and Number Checking (Minnesota Test for Clerical Workers). The uncorrected R was about .74. Porteus T. Q. carried the heaviest regression weight."

He continued this study by examining girls who passed the aptitude tests but failed on the job and noted a peculiar characteristic in their Maze performance. "The high-test, low-performance girls," he says, "for the most part, were characterized by 'shattering' on the Maze. They would go along all right until they made their first error, usually at about IX or X. Then they would lose their caution and grip on themselves, lose their personal composure, and start tracing at random. On the other hand, the high-performance girls would buckle down and intensify their concentration when such an error occurred." All experienced examiners are familiar with what Brundage calls "brittleness" in test performances, but its relation to industrial inefficiency has not before been so clearly pointed out.

The writer has never placed much emphasis on the use of the adult mazes, but it is evident that observation of reactions to failure are most important and the use of the more difficult designs will provide additional opportunities to note such effects. Some psychologists at one time were inclined to criticize the Maze because it depended on only one form of test material. The modern viewpoint is entirely the opposite. It is recognized that a test which requires fifteen to twenty minutes' intensive concentration of attention on a task involving the same mental set and mental capacities has a much closer relation to everyday requirements than the sudden spurts of mental activity involved, say, in a rote memory test or the definition of a word in a vocabulary list. In the Maze test, the basic data of the problem does not change as markedly as it does in a vocabulary test. In short, the homogeneous character of the data and the mental operations involved is one of the most advantageous features of the test. The constant repetition of the situations in which decisions

must be made affords the subject a chance to readjust his methods in the face of errors or increased complexity. He is proving his ability to deal with more complex relevant stimuli, which is of the essence of intelligent adjustment.

Morgenthau (11) investigated the statistical reliability of the various tests, using equivalent forms, and found the coefficient to be .95 for the Maze, .93 for the Binet. Some of the Maze intercorrelations were puzzling—.7 with the Thorndike Reading Test Alpha II, .7 with the Healy P.C.2, .54 with the Binet, but only .36 with the Pintner Non-Verbal. Weisenburg, Roe and McBride (34), in their study of adult hospitalized patients, also found the test relationships "puzzling." The highest was with the Printed Analogies Test (.62), followed by .59 with the Stanford-Binet, and .58 with the Pintner Non-Language. Even the Gates Oral Spelling Test correlated .41 with the Maze. Worthington's study (36) was concerned with the correlations of a group of tests, mainly of the performance type, with the Binet. The Maze correlated .75, the Seguin Form Board .76, the Healy P.C.2 .41, and the Knox Cube .56. Louttit (9) has tabulated some of the Binet-Porteus correlations and compared them with his own data on Indiana Clinic cases. He obtained coefficients between Maze and Binet of .61 for boys, .73 for girls. Gaw (5), using as subjects canal-boat children in England, obtained a Maze-Binet correlation of .52. The writer has summarized most of the studies prior to 1933 in his *Maze Tests and Mental Differences*.

Catholicity as regards relationship of the Maze with tests of the most diverse nature is certainly a marked and rather puzzling feature of this test. The correlation of the Maze with the Binet can, I believe, be accepted, for ordinary sampling of cases, to be between .6 and .7, but the relationship with other performance tests is somewhat surprising. Earle and Milner obtained correlations of between .3 and .4 with the tests they used, while Morgenthau found that even as non-intellectual a test as Tapping correlated .48 with the Maze. Peterson and Telford (13) examined Negro school children on the island of St. Helena off the South Carolina coast, and quote such correlations as .28 with the Goodenough Drawing, .51 with the Digit Symbol, in quite the reverse order to what might be expected. The average of all

correlations with the Maze was .42, the next highest average being .29 in the case of the Two Figure Form Board.

Vicary (32), who tested children of Indian aboriginal tribes at a mission school in Bengal, also found higher intercorrelations for the Maze than for other performance tests. The coefficients with the total of the tests used were .73 for the Maze, .66 for Cube Imitation, .57 for the Diagonal Test, .56 for Healy Construction A, .55 for Goddard Form Board, and .5 for the Triangle Test. An average of the coefficients of each test with the other five taken singly put the Maze in first place with .38, the Goddard Form Board second with .27, the Diagonal Test .25, the Cube Imitation .24, the Healy Construction A .24, and the Triangle Test .16. On the basis of g-factor loadings Vicary combined these tests in a battery with the following weighting: Maze 5, Form Board 2, Cube Imitation 1.

A reasonable interpretation of the above widely confirmed results would be that whatever capacities are tested by the Maze, these also enter to some degree into the successful performance of almost all types of test, verbal and non-verbal. Moreover, the intertest linkages seem closer with the Maze than for any other performance tests. The reason for this width of correspondence is by no means obvious. In common with other investigators, the writer has been surprised by some apparently inexplicable relationships. In general, it has always seemed remarkable that the ability to thread a way through a series of graduated maze designs should be related in any significant degree to social adaptability, into which so many capacities enter. The writer has come now to the conclusion that it is the *lack of uniqueness* of the test rather than its peculiar nature which provides the explanation. In other words, the only theory that seems to fit the facts regarding the catholic relationships of the Maze is that planning or prevision must enter into every mental task or mental operation. This is true of verbal tests also. We may state the conclusion in another way by saying that prehearsal of solutions is an essential part of every purposeful response. Even in such a test as a Stanford Vocabulary there must be a subvocal rehearsal before the overt reaction of framing the definition in words. Because planning enters into the operation explains why Weisenburg *et al.*

found correlations of the order of .3 and .4 between tests of this type and the Maze.

The notion of anticipatory excitations or prehearsals is basic to the writer's theory that all mental operations involve the setting up of neural circuits, or in psychological terms, that *all responses are circular* (23). Actions that require little or no planning are those that have become automatic or, in other terms, those activities for which the neural circuit is already complete. In situations which present multiple choices, the prehearsal takes a longer time and there is a greater delay in reaction. There are some specific tests of the capacity for foresight and planning, and the Maze is recognized rather generally to be predominantly a test of this nature. Because this planning is so fundamental in human activity, the Maze score is found to have the wide relationships that correlational studies indicate. Every valid test is to greater or less degree a test of planning capacity.

Any task which calls for visual and motor coordination necessitates the interplay of widely separated functional areas in the brain. There are few, if any, narrowly circumscribed neural circuits, and many mental operations such as the solution of a maze problem involve the major portion of the central nervous system. Hand and eye movements dependent on the motor area, visual interpretation, subvocal judgments are merely part of the mechanics of maze tracing, while memory and the sustaining of attention also enter into successful performance. Since fearfulness of failure and moderate anxiety are also typical of many individuals' reactions, the thalamus and hypothalamus are also involved, while cerebellar connections affect steadiness and motor control. In short, since this wide interplay is essential, good planning depends very largely upon a well organized neural system. Apparently the prefrontal areas play a very significant part in planning, because when 80 to 85 per cent of the subcortical connections of these areas with the rest of the central nervous system are cut by the operation of prefrontal lobotomy, there is a marked deficit in maze performance (24). The reason for the comparative failure of the feeble-minded to make good responses in the Maze resides in the presumptive fact that their brains are poorly organized, especially in the prefrontal areas.²

Other conditions which affect maze perform-

² See article on Prefrontal Lobotomy.

ance adversely have also been demonstrated, among them debilitating diseases such as hookworm infection and vitamin B deficiency. In 1918 Waite and Neilson (33), working in North Queensland, demonstrated that both Binet and Maze performance were impaired in the lightly infected, and still more seriously in the heavily infected. In the eleven-year maze the hookworm cases were slower, taking on the average nine seconds longer to complete the design.

O'Shea, Eldom and Higbe (12) induced vitamin B deficiency in a group of voluntary subjects. In addition to the Maze, the Henmon-Nelson Test of general ability, the Otis Quick-Scoring Test, the Thorndike-McCall Reading Test, a Tapping Test and the Healy Picture Memory Test were used. The authors' conclusion is that "deficiency of the B vitamins is associated with impaired ability to solve a series of mazes, that this impairment begins early in the deficiency and progresses as the deficiency deepens, and that it may be restored by the administration of either thiamine alone or the B complex." The control group, on the other hand, showed no significant variation throughout the observation period. A special point-scoring was used for the Maze which was reapplied in variously rotated positions to avoid practice effects. It is interesting to note, as the authors remark, that general intelligence, reasoning ability and tapping speed did not deteriorate in the vitamin deficient group.

There seems to be considerable support for the claim that the Maze comes reasonably close to being of universal applicability, regardless of cultural background, though Mann remarks: "This is a claim that is made for no other test (10)." Elsewhere in this volume³ results have been cited for such widely separated primitive peoples as the Luzon negritos, Borneo seagypsies (Bajou), Malayan mountain Sakai and coastal Sakai Jeram, Australian Arunta, Nyul-Nyul, Karadjeri, Iliaura, Keidja, etc., African Mchopi, Bathonga, Shangaans, Wakaranga, Vandau and Bushmen, all of whom accepted the test and worked most earnestly at it. Any psychologist or anthropologist with first-hand experience of primitive peoples would recognize the futility of attempting to apply a test which is quite foreign to the cultural set. His subjects would soon tire of it, and as Blackwood (2) has remarked with regard to the length of tests,

³ See article on Primitive Mentality.

it is a waste of time attempting to persuade a primitive subject to continue doing something after he has wearied of it. It is significant that the African Bushmen, who had the poorest average record of any primitive group, displayed extreme interest in the test (25).

Peoples of somewhat less primitive status showed equally keen interest in the Maze. Ainu boys from Northern Japan had an average quotient by the test of 106, Ainu girls 101, Formosan boys 102. Test quotients obtained by other groups were: Tamil coolies 94, Gurkhas (Nepal) 81, Ainu adults 93, Chinese Poorhouse inmates 83. Literate Chinese Poorhouse inmates scored 86. All other groups were illiterate, and were examined by Kilton Stewart (30). Wu (37) reports that Chinese primary school and kindergarten children numbering over seven thousand averaged at every level from 3 to 16 years of age about a half-year above their chronological age. He remarks, however, that the children were somewhat selected on the basis of intelligence and that testing conditions were faulty. On the other hand, Tsao (31) in Hopei province obtained an average T. Q. of 85 for Chinese subjects.

It is not contended that the Maze test is entirely "culture-free." One tribe, at least, in Africa (the Amaxosa) are familiar with a labyrinth game, the designs being drawn in the dust, but even so their records were below those of mission natives, though superior to those of other "raw" native tribes. It is also possible that peoples familiar with the making of string figures, a very popular pastime among some primitive groups, might possibly be helped in maze tracing, but that could only be proved by a special study on the subject.

The latest development with regard to the Maze has to do with its application to delinquents. It had been noted, in the first use of the tests with this class of subjects thirty years ago, that individual delinquents, though obviously maladjusted socially, sometimes scored well in the Maze. In 1922 the writer had stated (20) that the responses of these cases "may show qualitative differences from those of normals of equal test age," but nothing was done to follow up this lead.

In the meantime two studies, one by Poull and Montgomery (28) at Randall's Island, New York, and the other by Karpeles (8) at Providence, Rhode Island, showed that as far as

the general picture was concerned delinquents tended to have inferior scores on the Maze. The first-named investigators found that when a group of children with records of truancy, incorrigibility or stealing was compared with a self-controlled, diligent, cooperative group of children at the same hospital there was no difference between their Binet averages. In Maze test quotients the maladjusted group were 8.7 points below the well adjusted. The group differences in Healy P.C.2 average score were negligible.

Karpeles' two groups each numbered 185 cases and again the socially maladjusted were 8.27 points below the average of the control group. When the comparisons were confined to cases with Binet I.Q.'s above 80, the difference increased to 11 points.

In 1941 the writer began an analysis of qualitative errors, listing such things as cutting corners or crossing lines, irregular drawing, errors near the beginning or end of the test, lifting the pencil against specific instructions. Delinquents as a group made twice as many errors as non-delinquents, while adult criminals made three times as many mistakes as a group of one hundred bus drivers. The average error score of delinquent girls was 53, of non-delinquents 25. Delinquent boys scored 49 points, non-delinquents 22, criminals 57, bus drivers 18. The ordinary quantitative scores correlated with the qualitative scores, .4 for girls, .37 for boys (25).

With assistance in gathering data rendered by Dr. Charles Honzik, the study was continued in 1942. In all, eighteen other groups were examined and the tabulated results completely confirmed the previous findings with delinquents and criminals. "Undependable" pineapple cannery workers, disciplinary problem children in schools, were also compared with appropriate control groups. The results with a discussion of the whole problem have recently been published (27). It is confidently hoped that these qualitative error scores will provide another approach to the detection and study of predelinquent children.

Briefly summarized, the results were that students at a high school who were reported to be careless in completing assignments or unsatisfactory for reasons other than mental dullness scored 32 points, as against an average score of 19. In an intermediate school the average was

23 and the unsatisfactory students averaged 48 points. The experiment was repeated at another intermediate school and the "undependable" pupils' score was again 48 and the average for the school was 22. One hundred delinquents averaged 56 points in qualitative error score whereas in the previous investigation their score was 51. Only one point separated the scores of the second group of criminals from that of the group examined in the first study. When analyzed, the results showed that men convicted of crimes of extreme violence such as murder, rape, and assault with a dangerous weapon had an average error score of 67 points, while those convicted of less violent but impulsive sexual crimes averaged 57 points. As might be expected the burglars were somewhat better with 54 points and the forgers and embezzlers had the distinctly better record of 44 points. The differences between the averages of the satisfactory and the undependable cannery employees were also completely reliable from the statistical standpoint.

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PRIMARY ABILITIES.—It is universally acknowledged that mental ability is diversified so that men of equal level in mental endowment usually differ widely in what they can accomplish. Their particular aptitudes are called special abilities. The absence or low levels of the special abilities are sometimes called disabilities. Some of the well known among these groupings of ability are musical talent which often runs in families, artistic talent, mechanical ability, and verbal ability. These groupings are only roughly descriptive. When these are investigated experimentally they are found to be complex rather than unitary and it is an important psychological problem to ascertain how many fundamental abilities are implied in each grouping. For example, many thousands of musical tasks could be tried in appraising musical talent but it seems certain that they would be correlated and reducible to a smaller number of basic traits. It is equally certain that they do not reduce to a single musical trait. How many linearly independent traits are involved in this domain? That is the type of problem for which the multiple factor methods were developed.

In order to render intelligible the problem of identifying the primary abilities experimentally it becomes necessary to delimit each inquiry to a domain which is defined by a test battery of more or less related tasks. The factorial methods enable us to ascertain the number of linearly independent factors (abilities) that must be postulated in order to account for the observed correlations in the experimentally defined domain. It can be shown that this number is the rank of the table of inter-

correlations, regarded as a square symmetric matrix. When it has been thus determined that the intercorrelations of, say, thirty tests are of rank 5, for example, then the psychological problem is to identify these five basic traits which are responsible for the common variances in the test battery.

At this point there appears one of the most interesting forms of indeterminacy, the nature of which can be illustrated geometrically. In the geometrical model which has been found very useful for problems of this type, each test is represented by a test vector. In three dimensions these can be represented as long pins that are stuck into a central cork. The square of the length of each pin represents the fractional part of the variance of a test which it shares with other tests in the battery. A very short vector would then represent a test that has very little of its variance in common with other tests in the battery. A vector of unit length would represent a test which has no unique variance, since all of its variance is shared with one or more of the other tests in the battery. If three factors were sufficient to account for the intercorrelations in the test battery, then the whole table of correlations could be represented by a physical model with pins in a central cork. Each pin would represent a test. The correlation between any pair of tests would then be the scalar product of a pair of test vectors. No information would be lost in constructing such a model from the correlations which could in turn be reconstructed from the angles and the lengths of the vectors in the model.

The psychological problem is to identify the three fundamental abilities from the model if it is known experimentally that the rank of the intercorrelations is 3. The rank of the correlations is the same as the dimensionality of the model. In every factor problem we encounter just this situation in which the intercorrelations determine the configuration of the test vectors without any reference frame. The problem of identifying the fundamental abilities in the test battery is then geometrically the same as locating a suitable and meaningful reference frame in the model. If the test vectors are found to be arranged in a triangular configuration, then the most plausible location of the three reference axes is at the corners of the triangle. Sometimes these fundamental axes are found to be uncorrelated, i.e., at right angles in the

model, and sometimes they are correlated, in which case they are separated by acute or obtuse angles. The acute angles represent positive correlations.

When the problem has been solved, either geometrically or in the equivalent algebraic form, then it is possible to prepare what is called a factor matrix which describes each test in terms of the basic factors. An opposites test would then be described as having a large saturation in one of the verbal factors and perhaps zero saturation in some of the visual factors. An arithmetic reasoning test would be found to have saturation in several factors but it would probably have zero saturation on verbal fluency. When the resolution into basic abilities has been effected by these analytical methods, either geometrically or algebraically, the final test of scientific fruitfulness is in the meaningfulness of the factors or abilities that are so isolated. As long as they are arbitrary, they remain merely statistical artifacts of very little use for psychological science. But when they can be interpreted as psychologically meaningful aspects of perception, association, and thinking, then they become landmarks in our slowly advancing understanding of mental organization.

An equivalent statement of the problem is to consider first how many factors must be postulated in order to account for the experimentally observed intercorrelations. That is the rank of the intercorrelations. The next problem is to describe each of the tests separately with the smallest possible number of factors. When that has been accomplished we have the same solution as that which is obtained configurationally by the geometrical interpretation. The solution involves then two successive steps in parsimony but their scientific validity must be ultimately sustained by the test of all scientific experimentation, namely, our ability to comprehend the significance of each factor as a parameter determining the test performance, and our ability to predict the factorial composition of a new task by purely psychological considerations about the nature of the factors. Several of the primary mental abilities have already been subjected to such verification with gratifying results. Some primary mental abilities have been identified with sufficient interpretation to make them useful in describing mental endowment with a profile, but they constitute so far only

a small beginning of eventual exploration in this field.

The primary mental abilities so far identified with some confidence are number ability *N*, visualizing ability which has been called the space factor *S*, memorizing ability *M* which is probably distinct from incidental memory and several others such as visual memory, verbal comprehension *V*, verbal fluency *W*, induction *I*, speed of simple perception *P*, another factor that facilitates speed of perceptual closure, another factor that facilitates flexibility of closure, and two verbal factors, one of which facilitates association within restriction on the form of the response and another that facilitates association with constraint on the meaning of the response, and a naming factor which may be related to the verbal fluency factor.

There is indication also of one or more general intellectual abilities that underlie the primary mental abilities and which account for the inter-correlations of the primary mental abilities. It seems likely that the correlations between the primary mental abilities will sustain the early work of Spearman who postulated a central intellectual factor in addition to the special abilities.

It seems reasonable to expect that vocational and educational counseling will eventually be accomplished with the aid of tests assembled rationally rather than, as at present, with crude empirical investigations of the validity of each test for every possible type of criterion without rational foundation.

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PRIMATE PSYCHOLOGY. — The mammalian order of primates includes man, the anthropoid apes, Old and New World monkeys, tarsier, and lemurs. Except as otherwise indicated, the term "primates" will be used in this article to designate the infrahuman primates; "apes" will refer to gorilla, chimpanzee, orangutan, and gibbon; all the lesser primates will be referred to as "monkeys." It should be borne in mind that most of the available experimental data and much of our observational information have been derived from a few of an uncertain but large number of species. What is said about "primates" or about "monkeys," therefore, must be understood to apply with

certainty only to those forms about which we have knowledge.

The role and value of comparative psychology in the field as a whole have been discussed frequently and require little elaboration here. The salient facts are (1) that by virtue of sheer numbers and diversity of forms, most of the behavior that occurs is infrahuman behavior; (2) that basic mechanisms or principles of behavior are often more discernible in simple than in complex organisms; (3) that animals may be controlled in ways not possible with human subjects; and (4) that knowledge of phylogenetic development furnishes valuable clues regarding the nature of the end product. Among animals, the primates occupy a uniquely important position: They are on one side of the widest gap in the continuum of phylogenetic development that separates man from the highest infrahuman animals. They form the connecting link, therefore, between human and animal psychology. In this strategic position, they provide the most immediate point of attack in tracing the origins of human behavior. Primate psychology has had a balancing effect in counteracting the still-present tendencies (1) to demarcate human behavior sharply and qualitatively from that of other animals, and (2) to accept uncritically anthropomorphic interpretations of infrahuman behavior. Primate behavior is so similar to that of man that recognition of the continuity is inescapable in spite of the obviously great differences in quantity or degree along certain directions.

To trace the influences of primate psychology on psychology in general is beyond the scope of this article. That such influences have been frequent and critically important can hardly be questioned. Just a few examples must suffice. The acute observations and experiments of Köhler at Tenerife have had far-reaching effects on his own general psychological theorizing and, directly or indirectly, on that of all other psychologists; one need think here, for instance, only of such concepts as "insight" and "the restructuring of the psychological field." Influences and contributions of more modest and limited extent are extremely numerous: Several techniques (e.g., the use of token rewards), developed for the testing of behavior phenomena in the non-verbalizing chimpanzee, have been found useful in experiments with human

subjects. McCulloch's careful study of grasping behavior in chimpanzee and his analysis of the results, pointing to excitement- or tension-reduction as the mechanism of reinforcement, will or already has exerted a definite influence on the understanding of human learning.

The materials of psychology, behavior of the organism-as-a-whole, may be classified according to the situations in which it occurs: maze, problem box, Umweg, social—or according to explanatory categories: conditioning, memory trace, vectors, perceptual structuring, glandular insufficiency. Many other forms of categorization are possible, but these are among the main ones and serve to represent the choice between "operational" description and explanation. It would be very satisfying to have a survey of primate psychology organized entirely according to explanatory concepts, following the ideals of a program such as that recently suggested and initiated by Hull. This would mean that "social psychology" would drop out as a topic and that the data from social situations would be treated in connection with each of the basic psychological mechanisms or principles involved. The objections to such a consistently explanatory approach to primate psychology at this time are the relative paucity of factual raw materials, the incompleteness of our psychological analyses, and the consequent divergencies of opinion regarding explanatory concepts. In the following treatment the materials are organized under what the writer considers psychologically meaningful categories. For ease of identification, situational terms are introduced in many of the subheadings. Highly specific explanatory concepts are avoided in favor of more general or descriptive ones. It is obvious that for purposes of detailed experimental investigation it is usually necessary or desirable to "translate" or "reduce" the latter to more precise, testable formulations. Finally it may be noted that the distribution of space and emphasis reflects a judgment concerning (1) the amount of information available and (2) the relative importance, in *primate psychology*, of the various topics treated.

No attempt is made to dichotomize sharply the innate and experiential elements in behavior. Such factors as sensory acuity and motor capacities are admittedly dependent to a high degree on inherited structure, but so is the po-

tentiality for alteration of behavior through experience, for generalization, for abstraction, and for integration of present and past elements of experience. Compared to that of other animals, the behavior of man is relatively "free" and varied; a given sequence of stimulus situations does not ordinarily evoke rigidly and specifically determined, uniform responses. In this respect the infrahuman primates occupy a position between man and the lower mammals, the apes (at least chimpanzee and gorilla) probably approximating that of man more closely than do the monkeys. Where credible and important evidence exists for the essential innateness of a significant behavior pattern or for the critical role of prior experience, this is indicated in the text.

SENSORY CAPACITIES

The avenues of contact with the external environment are highly similar among the various primates, including man, the greatest deviations being found in the tarsier and lemurs.

Chemical sensitivity. Together with the whales, the primates are distinguished from other mammals by a relatively poorly developed olfactory apparatus. Although there has been almost no experimental work on the subject, observations of behavior in the field and in the laboratory confirm the anatomical indications that the sense of smell is not significantly better—or worse—in the monkeys and apes than in man. The fact that chimpanzees, for instance, often examine objects by bringing them close to the face (or the face close to them) may be misinterpreted as evidence for the prominent role of olfaction; such behavior probably serves mainly to permit tactual (lip) and close visual inspection. Although the sense of smell doubtless plays an important part in the selection of food, it seems to have a minor function in the search for food and in the detection of enemies and other dangers. Its importance in sexual behavior is uncertain. On the basis of structural rather than behavioral evidence it appears probable that the tarsier and especially the lemur may have some advantage over the other primates in respect to olfactory sensitivity.

The only experimental study of gustation (Patton and Ruch) indicates a differential sensitivity to various concentrations of quinine

which is closely similar for man, chimpanzee and macaque. Chimpanzees frequently reject food (especially milk and eggs) which is slightly spoiled. The same individuals may, on other occasions, accept extremely bitter substances when these are combined with a well-liked food such as grape juice or candy.

Audition. The lower intensity limen at various wave frequencies has been carefully determined for young chimpanzees (Elder) and for three species of adolescent and young adult monkeys (Wendt). From 64 to 128~ to about 2048~ the sensitivity of apes and monkeys was found to be quite similar to that of young adult human subjects. An apparent slight superiority of the chimpanzees may be attributable to their lower relative age. At 4096~ monkeys and apes show a marked diminution of acuity as compared to man. The reasons for the "4096~ dip" are obscure; in human subjects a general deterioration of acuity for high frequencies often begins with loss at this particular point. At the higher frequency of 8192 the relative sensitivity of the animal subjects increased considerably. This advantage (lower threshold) as compared to man was maintained by the monkeys at the still higher pitch of 16,384~. The greater acuity of subhuman primates in terms of intensity limens at high frequencies is consistent with Elder's finding that his chimpanzee subjects were responsive to tones ranging up to 26,000 to 33,000~ whereas children of comparable age had an upper limit of 22,600 to 23,700~.

Similarly careful investigations of pitch and intensity difference limens have not been made; preliminary studies along this line indicate that the training necessary for such determinations will be difficult. In chimpanzee, at least, localization of sound seems to be of about the same order of accuracy as man's. No controlled and systematic study has been made of primate ability to discriminate complex sounds such as of the human voice; in the reports on pets and stage performers the possibility of response to other cues, such as gestures, temporal routine, and so on, has not been excluded.

Vision. Spence has shown that the visual acuity of chimpanzee is quite similar to that of man. In terms of the visual angle subtended at the eye by the least perceptible width of lines (using the Ives test objects) the 75 per cent threshold values for chimpanzee ranged from

4.57 to 0.47 minutes, whereas for human subjects the corresponding values were from 3.09 to 0.44 minutes. As in man, visual acuity of the chimpanzee varies directly with the logarithm of brightness of the test objects, at least within the range of 0.00138 to 3.98 millilamberts. There is some indication that in man and chimpanzee acuity decreases at very much higher brightness levels. Weinstein and Grether's study of rhesus monkeys and Johnson's experiment with the cebus monkey indicate that the minimum separable acuity of these primates is of the same order as that of man and chimpanzee. Preliminary tests made by Klüver by the "minimum visible" method with Java monkeys indicate a visual acuity lower than, but probably not significantly inferior to, that of the aforementioned primates. Grether has shown that the slight superiority of man over chimpanzee and rhesus monkey is further reduced when differences in eye-size are taken into account and acuity is calculated on the basis of retinal image width rather than of visual angle. This fact is of physiological rather than behavioral significance, since the eye as a whole and not only the retina determines what the animal sees.

Limens for brightness discrimination of rhesus monkeys were determined by Crawford. At levels of 0.77, 7.1, and 55.3 millilamberts the monkeys discriminated brightnesses differing by about 11 per cent with 75 per cent accuracy; at 0.08 millilamberts a difference of 36 per cent was necessary to obtain this degree of accuracy. Adult human subjects met the same criterion with a fractional brightness difference of about 11 per cent at the 0.08 level and of about 7 per cent at the higher brightnesses. That is, the monkeys were slightly inferior at brightnesses of 0.77, 7.1, and 55.3 millilamberts but were definitely inferior at the lowest level. It may be that the adaptation level of the monkeys was not as favorable as that of the human subjects at the 0.08 millilambert brightness and that this fact is largely responsible for the greater discrepancy at this point.

The careful and extensive investigations of Grether indicate that the color vision of chimpanzees differs only slightly from that of the normal human trichromatic eye. Hue discrimination is equal to that of man in all parts of the spectrum excepting at wave lengths longer than 600 μ where the limens of chimpanzee

become roughly twice as great as for man. The evolution of color vision mechanisms has apparently progressed a little further in man by permitting somewhat greater differentiation at the long wave-length end of the spectrum. The spectral limits of chimpanzee (402 to 704 mμ) are as wide as those of man. Tests with color mixtures indicate that sensitivity to longer spectral wave lengths is equal for man and chimpanzee, but that there may be a relatively reduced saturation of red (610 mμ) for the chimpanzee. Experiments with several species of Old World monkeys and with one female spider monkey indicate that the color vision of these animals is roughly equal to that of man; if there is any difference it is in the direction of slightly reduced sensitivity and hue discrimination capacity in the yellow and red regions. Three male cebus monkeys yielded results comparable to those of human dichromatic vision of the protanopic type; it is possible that this deficiency is a species characteristic or that in these monkeys, as in man, dichromacy is limited largely to males of the species. It is highly probable that in the nocturnal lemurs and in tarsius color vision is completely absent.

Other sense modalities. Observations strongly indicate that chimpanzees, and probably the other primates as well, are much less sensitive to pain than is man. This conclusion obviously is based on the infrequency of behavior interpretable as expressing pain; in view of their free and ready emotional expressivity, it hardly seems likely that these animals would inhibit reactions to what we know as pain. Animals with severe wounds sustained accidentally or in a fight show few signs of discomfort and go about their business in normal fashion. Visceral pain, such as that accompanying parturition and dysentery, or following a major abdominal operation, elicits somewhat greater response. One adult chimpanzee, however, with multiple intussusceptions, probably of several months' standing, gave no observed signs of discomfort until a few hours before death. Some individuals pluck out their own hair until they are practically naked; others, with pinworm infestation, pick at the anus until it is bleeding freely.

McCulloch has shown that young chimpanzees could discriminate a 9.2 per cent difference between two weights (at the level of 80 grams) with about the same degree of accuracy (75 per

cent) as is achieved by human adults. Using the pulling-in technique with Java monkeys, Klüver obtained 90 per cent accuracy when the effective masses differed by an estimated 30 per cent at the 125 gram level. The skill exhibited by most primates (least of all by the gorilla) in arboreal locomotion attests a well-developed sense of balance, similar, perhaps, to that of a highly trained professional acrobat.

Although their skin is relatively thick, the tactual sensitivity of many primates appears to be fairly keen. Grooming activity in the chimpanzee and various monkeys, although aided by vision, indicates a high degree of precision in tactual localization. One of Klüver's cebus monkeys was able to find a thread of 0.204 mm. diameter in complete darkness. Kohts' chimpanzee identified geometrical shapes by manipulation. In chimpanzee the most sensitive areas are probably the lips.

Except for such casual observations as that temperature extremes are avoided, nothing is known about the temperature sense in primates. Observations in the field indicate that chimpanzees may communicate with each other by pounding on the ground or against a tree trunk, suggesting the possibility of a well developed vibratory sense.

MOTOR CHARACTERISTICS

Locomotion and posture. Climbing and arboreal locomotion are common among all primates except the baboons, who are completely terrestrial, and the gorilla which spends most of its time on the ground. Pronograde progression is the general rule, usually with the trunk above, but not infrequently suspended below, the limb. Brachiation, a specialized form of underslung locomotion, is preferred by the gibbon and is seen also in some of the monkeys, especially the New World spider monkey. On the ground, quadrupedal locomotion is invariable in the baboon, usual for most primates, rare in the gibbon. The weight of the body rests on the soles (or outer edges) of the feet and on the middle knuckles of the fingers in the case of the great apes, on the soles and palms of the other primates. Orthograde, bipedal walking is seen most frequently in the gibbon, less often in gorilla, chimpanzee, and orang. Suspension of the viscera in the anthropoid apes is similar to that in man and favors an upright posture in sitting and walking; in monkeys the viscera

sag to the bottom of the abdominal cavity when the trunk is in a vertical position. Most of the monkeys probably are able to swim; the evidence for this ability is definitely negative for the gibbon and chimpanzee.

Manipulative skill. The primates are distinguished for the skill and especially for the variety of ways with which they can manipulate the environment. The hands, feet, lips, teeth (and, in the case of many of the New World monkeys, the prehensile tail) contribute to this ability. In comparison to man, the skill of the feet more nearly approximates that of the hands; and laterality is less dominant. A given individual usually has a preferred side, but this apparently is as often the left as the right side and may be different in different activities. Eye-hand coordination and the precision of delicate movements in such "natural" activities as grooming, are especially remarkable in view of the greater thickness of fingers as found in chimpanzee. Much of the awkwardness which appears in artificial situations is probably a function of limited practice and may be overcome by training procedures. Relatively little serious work has been done to determine the ultimate capacities of primates in motor skills. Thumbs and great toes can be rotated and opposed to the outer digits in all the primates having thumbs. (Thumbs are absent or vestigial in the New World spider monkeys and in the colobus monkeys of Africa.) As compared to man, however, thumb-finger opposition usually serves gross movements, such as the grasping of a limb, rather than fine prehension. In picking up a small pellet, for instance, the chimpanzee tends to use a pincer-like movement of the second and third fingers.

Speed and strength. Measurements of simple reaction-time of young chimpanzees (Forster) give values similar to those for human children: about 243, 223, and 206 milliseconds for visual, auditory, and tactual stimuli, respectively. It has been estimated that on the ground baboons can travel almost as fast as dogs, and that for short distances the speed of gibbons brachiating through trees may be as great as that of a fast human runner. All primates and especially the great apes give the impression of being very strong and it is true that four men have great difficulty in holding down a five-year-old chimpanzee when the latter is highly excited. On the other hand, measurements of muscular

strength in the calm but well-motivated chimpanzee give indices which, in proportion to body weight, are similar to those of man (Finch).

SOCIAL FACTORS IN BEHAVIOR

Groupings. Most of the primates are notably gregarious creatures. The adult male orang is perhaps the least social of the primates, according to report, living by himself most of the time and meeting with his females and their children only occasionally for the purpose of mating. Gorillas and chimpanzees live in family groups comprising about 4 to 14 individuals: a large male, several adult females, and children ranging from infants to young adults. These groups are nomadic, but the extent of their wanderings has not been determined. According to Carpenter, the gibbon lives in family groups of 4 to 6 animals, a number of such families being banded together and having a territorial range of 30 to 100 acres. The baboons are usually found in troops of 30 to several hundred, each troop comprising numerous family groups. The common rhesus monkey is found in groups varying in size from 2 to 150 or more individuals, the number of females always exceeding the number of males. Carpenter has made careful population studies of two New World primates, the howler and spider monkeys. The former live in clans of 4 to 35 animals (average 17), each having a very definite territorial range. Spider monkeys congregate in groups of 30 to 40 at night, but these often divide into subgroups of 3 to 17 during the daytime. The tarsier and aye-aye are usually found in pairs (male and female), sometimes with an infant.

Dominance. In the relationships within primate groups dominance of some degree is a common feature. Its expression, however, varies widely. Among the baboons, according to Zuckerman, it is very direct: sheer strength and fighting ability determine which one is to get the food and which one is to mount the female. In these fights it is the females rather than the males who carry off most of the scars of battle. Although it can perhaps be stated as a general rule that among primates males tend to be dominant over females, this may be more a function of size (the males usually being larger) than of sex *per se*, and it is a generalization which has many exceptions. Among the New

World howler monkeys described by Carpenter, for instance, the female in oestrus takes much of the initiative and selects the male of her choice; if one male does not respond to her solicitation, or has been satiated, she passes on to another male. Overt fighting is rare among the howlers, gesturing and noise-making substituting for actual combat. The dominance-status between chimpanzees is sometimes decided by physical combat, but much oftener by "common consent," such agreement being preceded sometimes by bluffing and exhibitionistic behavior, sometimes by extremely subtle, almost unobservable, gestures, postural attitudes, and vocalizations. Maslow, pointing out that dominance in one activity (e.g., food-getting) does not necessarily mean dominance in some other relationship (e.g., sex), suggests the need for specific terms, such as food-dominance. In general, there does seem to be a positive but imperfect correlation of dominance in various fields or aspects of social behavior.

Cohesive factors. Some friction or conflict of individual interests may be seen in almost any primate social group. The positive factors, bringing and keeping the members of a group together, are doubtless numerous and vary from general to specific. As with any organism, differences in environment operate to concentrate members of a species in the more favorable habitats. Satisfaction of the sex and parental (especially maternal) drives specifically demand a social milieu. There is safety, or at least the feeling of safety, in numbers. (Whether innate or experiential factors are the more important here is uncertain.) It is probably true that a natural enemy would be more hesitant about attacking a group of apes than an isolated individual. In most if not all wild primate groupings observed, a common front of defense is presented to the outside threat. Even when this endures only during the preliminary stages and disintegrates if the attack becomes actual, it usually serves its purpose. Wild chimpanzees have been seen to come to the aid of companions (especially of infants and children) even at risk of their own safety. A group of captive chimpanzees is much more dangerous to the human observer than are the individuals composing it; if one of the group becomes fearful or angry, it gives a cry which acts like a trigger to set off an attack by all. In general, however, the primate group acts as a group defensively

rather than offensively. Young chimpanzees, in whom the sex and parental drives presumably have no importance, manifest a "social need" even more than adults. They become extremely excited and distressed if deprived of their companions and under these circumstances are likely to become attached to their human caretaker. Infants raised in isolation from their kind become very jittery animals unless the substitutes for the ape mother expend a great deal of time and helpful attention on them. The young of all primates have more or less prolonged periods of dependence. The chimpanzee does not locomote effectively until the age of six months or later and derives its main nourishment from the mother's milk for at least the first year of life. The early care of the infant is mostly maternal, but later the father and other members of the group take part in playing with the youngster. Among gibbons, too, the paternal role is fairly important, changing from a playful, protective, and helpful one to antagonism in the case of male offspring approaching maturity.

Grooming and food-sharing. Aside from the biologically primary functions which are enumerated above and which are rather generally applicable to most of the mammals and to many inframammalian animals, grooming (often spoken of as "flea-picking") of one individual by another is the most frequently observed form of constructive relationship among primates. Yerkes assigns it great importance as the possible precursor of many "social services" appearing later in phylogenetic development. In chimpanzees, the typical pattern of grooming behavior appears among nursery-raised youngsters who have not had opportunity to observe the behavior of adult animals.

Most captive chimpanzees become friendly with their cagemates, and among such animals there is ordinarily peaceful and fairly equal sharing of the food supply. If two such animals are placed in adjacent cages, separated only by widely spaced bars, and the entire supply of food is made available to one, a good share of the food will be transferred to the partner. Such transfers will occur in one or all of three ways: (1) By accident or intent the "rich" animal spreads the supply around in his cage so that the "poor" one can get some by reaching through the bars. (2) The second animal begs or solicits, usually by stretching out an

arm horizontally and making rapid upward flexions of the fingers, often whining or whimpering at the same time; sooner or later the first animal usually responds to this begging by handing or tossing over a piece of food.

(3) Sometimes the "rich" animal hands over food at times when the partner is not begging. On occasion an animal will tease his partner, starting to hand him a bit of food and then withdrawing before the transfer has been completed. There is evidence that wild chimpanzees will toss fruit down from a tree to a member of the group which, because of illness or injury, cannot climb the tree.

Cooperation. There is little evidence of teamwork or cooperative problem solving among wild primates—less, probably, than in some insect societies. Crawford trained young chimpanzees to work together in pulling in a food-baited box which was too heavy to be moved by one animal alone. Each partner had first learned the task individually. The great difficulty for the chimpanzees came in coordinating their efforts, in learning to pull at the same time instead of successively. This difficulty was eased by a verbal command from the experimenter to which the animals had previously and independently learned to respond by pulling. Later, the command could be omitted.

Communication. Most of the primates are noisily vocal creatures, but it is most doubtful that any of these vocalizations may be thought of as "language" in the sense in which the term is applied to man. The vocal apparatus of the anthropoids is similar to the human, but attempts to teach them to "speak" have met with little success. Efforts to train the apes to respond differentially to the spoken commands of man have been less successful than with dogs. Whether the reasons for this limitation are to be sought in differences of kind and degree of motivation effective with wild *versus* domesticated animals, in the great prepotency of the visual sense at the expense of the auditory mode, or in certain characteristics of the peripheral or central nervous system, is uncertain. The vocalizations which do occur—relatively infrequent in the gorilla, frequent and extremely varied in chimpanzee, frequent but with fewer variations in the monkeys—are emotionally expressive; they are responses to vitally significant situations. Their meaning being "understood" by other members of the group,

they have a communicative function. The cries of alarm and of anger, the vocalizations accompanying food-begging and sex-solicitation, the grunts associated with something pleasant, are responded to appropriately by others of the species. The communicative efficacy of vocalization is, however, general and "releasive" in character, rather than specific and "directive." The available evidence suggests that vocal communication may be more highly developed in some infraprimates societies (e.g., birds) than among the monkeys and apes. In chimpanzees, directive communication is largely gestural and postural, as seen in the following examples.

The adult male having discovered a group of human beings hiding in a natural blind, at once hurries to a tall tree in which a female with her infant, who have been under observation, are resting; he climbs the tree and with his hands turns the trunk and then the head of the female until she is looking straight at the hiding place; then he climbs down with the infant, the female following and they all disappear silently into the forest. Jack, a caged adult male, has an erection and, as the observer passes, he pounds with a foot against the door leading to the adjacent cage containing a receptive female, at the same time smacking his lips and pointing with a finger through the wire mesh at the padlock which keeps the door closed. After the two chimpanzee partners have learned to coordinate their efforts in pulling in the heavy box in the previously described experiment on cooperation, the motivation of one is radically reduced by satiation with the kind of food used as a lure on the box. The still hungry animal tries to persuade the partner to work, putting a hand on his shoulders and guiding him to the working side of the cage, then placing the rope into the partner's hand. The directive gesture of begging has already been described. In perception of the intent and attitude of their fellows and of their human contacts, chimpanzees are astonishingly keen; minimal changes in facial expression or posture in one individual influence the actions of a cage mate. The lack of language, of an organized, conventionalized system of symbols certainly is the most striking behavioral difference between man and the lower primates; it may well be that there is an intimate relationship between the development of the communicative aspect of language and its function in problem-

solving ("thinking" or "reasoning") which is discussed below.

Certain other aspects of social behavior are considered in the following sections.

DYNAMIC ASPECTS OF BEHAVIOR

Activity level. With the partial exception of tarsier and some of the lemurs and primitive monkeys, most of the primates are very active animals. Even in youth, before the serious business of earning a living has started, and in captivity where most wants are supplied without effort, a high level of activity is maintained. There are, of course, considerable individual, species, and age differences in this respect, the chimpanzee being more active than the gorilla and young individuals generally more so than adults. Quite aside from ends, goals, objectives, or rewards to be attained, the potentiality for behavior seems to provide its own impetus for overt expression or realization. The young captive chimpanzee (and this applies to a considerable extent also to the wild animal) exhibits a tremendous variety of "play" behavior, inventing endless acrobatic games—somersaulting forwards and backwards, gyrating like a moving, spinning top, with hands extended gracefully over the head, holding to a wire partition and then flipping over backwards to the ground, climbing out on a limb to its outer end until it is sagging down to where the animal can drop safely to the ground or to a lower limb, and so on, endlessly; finding new ways of eating and drinking—peeling a grape and eating the inside first, the skin later, taking a mouthful of milk, spilling it on the concrete floor and then lapping it up, soaking a hard cracker under the water faucet before eating, voluntarily regurgitating and then reingesting food; discovering novel ways of looking at the world—by standing upside down or bending over and peering through the legs, by punching a hole in a leaf and, holding the leaf close to one eye, looking through the hole, by producing a puddle of urine and gazing at the reflections therein; decorating the body with a stray piece of cloth or rope draped around the neck, keeping himself clean by endless self- and heterogrooming; examining strange objects in minutest detail and tearing them apart down to the smallest possible fragments; provoking social response in members of the same or other species by teasing, bluffing, attacking, spitting,

throwing sand or feces, or by friendly overtures of kissing, "tandem walking," and even the gift of food, a loose bolt or stick. Any or all such items of behavior may of course be subsumed under various drives or needs—of curiosity or exploration, gregariousness, and so on—if such categorization seems helpful. To be stressed here are two facts: (1) that chimpanzees tend to be doing something most of the time, and (2) the diversity of these activities. These characteristics obviously are the *sine qua non* for intelligent behavior on the higher levels of complexity. A third fact, which doubtless has much to do with the limitations of primate behavior, is that with few exceptions (grooming and certain tics and stereotypies) they do not stick at any one activity for any length of time. Their "power of concentration" is low. Kinder found that in the age range of one to three years chimpanzees in a rather stimulating environment changed from one activity to another once every 10 seconds or less.

Fear, maternity, companionship. Little or nothing has been done to obtain indices of the relative strengths of various drives in the primates. They are discussed here in an estimated order of decreasing intensity. Responses of the fear-anger class certainly have prepotency over any others. That is, whatever else the animal may be doing at the time will be abandoned in favor of flight or self-protection. (This probably is true of all animals, including man, but is especially evident in the monkeys and apes because they are afraid of so many things and because their chief mode of dealing with dangers is to run away from them.) Under normal conditions, the maternal drive is probably one of the strongest of the motivating forces directing primate behavior. In captivity it sometimes happens (especially among primipara) that a chimpanzee will abandon her infant completely, or will give it only half-hearted care, but the usual picture is one of devoted attention and jealous protectiveness. As was mentioned above, the need for companionship seems very great indeed in most of the primates. The external condition satisfying this need, however, seems to be determined by experience. Infant chimpanzees reared in isolation from their kind are indifferent to each other for weeks or months after they have been placed together. Infants raised in a human social environment may continue to prefer human companionship to that

of their fellow apes long after they have been caged with other chimpanzees. There is even a suggestion that early attachment to human companions may interfere with the later development of normal sexual behavior in the male chimpanzee. Young chimpanzees have strong and lasting preferences among their companions as has been shown by Nowlis. That the "pinning away" of an animal after removal of a favorite companion (of the same or other species) is more than a myth is suggested by observations in several instances.

Sexuality in chimpanzee. The strength of the sex drive in chimpanzees is difficult to evaluate. The extensive studies of Yerkes, Elder, and others indicate that the female is receptive only during the phase of sexual skin tumescence, about 10.4 days of the 35-day (average) cycle. It is believed that ovulation occurs near the end of this phase, when tumescence and receptivity are at maximum. Copulation at other times of the cycle (during detumescence, including menstruation), when it occurs (infrequently among friendly animals, more often when the two individuals are hostile or are strangers), has been interpreted as rape or prostitution in exchange for freedom from attack, for food, or for other favors. Individual females differ considerably in manifestations of the sex drive; some solicit the male frequently whereas others appear merely to submit to the demands of the male. Two adult females are on record who never allowed the male to mount. The pattern of mating behavior is highly uniform in the female chimpanzee, and this complete, typical pattern has been observed in a young individual on the first occasion after puberty when she was caged with an experienced male. Masturbation, usually manual but sometimes utilizing fixed objects of the environment (e.g., a water faucet), is very frequent in a few captive specimens) becomes fairly common, methods of stimulation being diverse: the hand, great toe, mouth, wire grill, floor, or another animal may be used. Masturbation usually disappears in the adult male if females are available, but may persist, rare or absent in most.

The male chimpanzee shows more variability in sex behavior than does the female. Erections are frequent in infancy, especially at feeding time, and during childhood whenever there is excitement of any kind. Towards the latter part of childhood masturbation (without ejacula-

persist or reappear if he is caged alone or with other males. Individual males vary greatly in their readiness to mate as they reach adulthood. Some copulate promptly and frequently at the first opportunity; others seem not to know what to do in the presence of a fully receptive female and the first mating may not occur for months or years after this might be expected on the basis of age and physical development. Some males will mate rather indiscriminately with any female at almost any time during the cycle, whereas others are highly selective, both as to individual females and as to the phase of the female cycle (Yerkes, Elder).

The dominance of the female chimpanzee is significantly greater during tumescence than during the period of detumescence (Yerkes, Nowlis, Crawford). In a competitive food-getting situation, for instance, the female in swelling will ordinarily, as a matter of course and without protest from the male partner, take precedence. As soon as detumescence sets in the roles are reversed, as it seems by common consent, and the male takes priority. This is the rule to which there are many exceptions in various pairings.

The hunger drive. The hunger drive and the incentive or condition which satisfies it lend themselves more conveniently to quantitative control and variation than do any other motivating conditions. Most of the experimental work on motivation has dealt with influence of different kinds and amounts of food reward on physical and mental work and on learning. Casual observation indicates that the efficiency of various activities, including especially discrimination learning, is greater when chimpanzees are moderately hungry than when satiated or starved for longer periods of time. This has been confirmed recently by Birch in a systematic investigation; under conditions of extreme motivation the attention of the animals was focused so intensively on the goal that other features of the situation, which provided the means to the goal, were overlooked. With some chimpanzee subjects it has been noticed that success in a problem can be its own reward; given all the banana it could eat before a training session, one animal worked enthusiastically for 60 trials, improving its mastery of a discrimination problem during this time. At the end of the session 60 pieces of banana, used as "reward," were found uneaten in the work-

cage. In tests of bodily strength Finch discovered that with a food-deprivation period of 24 hours *versus* "normal hunger conditions" two chimpanzees refused to pull, "three bettered their 'normal' records; one pulled the same under both conditions; two pulled less." In tests of food-dominance with pairs of chimpanzees Nowlis found that satiation of the normally dominant partner increased the proportion of food obtained by the subordinate partner and that the amount of food obtained by the latter was a function of its own hunger drive (as determined by length of the deprivation interval).

Incentive factors. Fletcher has made an elaborate analysis of performance (pulling against the force of gravity and of an electric brake in order to obtain a food reward) by young chimpanzees as influenced by the size of the incentive. With a fixed resistance, the frequency of response could be increased from zero (refusal to do any work) to 100 per cent (overcoming the resistance at every opportunity) by increasing the size of the incentive; an ogive curve represents this relationship. An approximately linear relationship was found between size of the incentive and the maximum work which the animal was willing to do in order to obtain it. Maslow and Groshong tested a gibbon and several species of monkeys in the delayed reaction problem and found that efficiency of performance was greater for preferred than for non-preferred kinds of food-reward; they point out, however, that "it requires a large difference in motivation to produce a relatively small difference in efficiency of performance." Delayed response experiments with chimpanzees have shown (1) that the accuracy of performance at a fixed delay interval is markedly greater with large than with small incentives of the same kind, (2) that the "limits of delay" (longest delays possible before accuracy falls below 75 per cent) are considerably higher when large rather than small rewards are used, and (3) that accuracy of performance is affected not only by the size of incentive and length of delay in any given trial but also by the reward-delay relationships obtaining in previous trials.

Token rewards. The work of Wolfe and of Cowles shows that chimpanzees perform almost as well in physical work and discrimination learning situations when correct responses are

rewarded with tokens (poker chips) which later can be exchanged in a slot machine for food, as when they are rewarded with the food directly. Some learning problems were mastered within a single session (of 20 trials), which means that the problem was solved without any primary reward, opportunity for "cashing in" the tokens not being given until the end of a session. The tokens lost their efficacy when opportunity to trade them for a desired object (food) or activity was withdrawn. The incentive-value of each token decreases as the animal's stock of such tokens increases. "In social situations the tokens elicited competitive behavior similar to that evoked by food" (Wolfe). On the basis of size, weight, texture and color differences the chimpanzees differentiated between tokens of differing values and chose water-tokens when thirsty, food-tokens when hungry.

Emotionality. In our Western civilization expression of the emotions is inhibited, suppressed, or repressed so effectively, sometimes, that it requires a long psychoanalysis for the individual himself to become aware of his feelings. It may be doubted that the infrahuman primate has many emotions hidden away in the unconscious. Nor is this because of a paucity of emotional responsiveness. The chimpanzee is emotional about many things, at frequent intervals, and expresses those emotions freely and promptly. In respect to no other aspect of behavior is this ape so almost human, so much a caricature of man. Implied here is the assumption that we can recognize emotions in animals and that we have the scientific right to apply to them terms deriving from human behavior and having, often, a decidedly mentalistic flavor. This problem cannot be discussed here. Hebb recently has presented cogent arguments for the logical justification, necessity, and scientific fruitfulness of resolving our confusion of the behavioral and mentalistic aspects of terms used in this field. As he points out, the fact that to us the state of awareness involved in "anger" or "fear" seems to be the critical element, does not vitiate the further fact that under certain circumstances others can recognize our "anger" with accuracy even when "verbal behavior" is not involved. The process of emotion-naming in ape and man utilizes similar behavioral indicators. With the highly expressive chimpanzee such recognition is often facilitated.

The forms of emotional expressivity vary considerably from species to species, from individual to individual, and in the same individual at different ages. In an experimental study in which food-reward for a certain performance was withheld or reduced in quantity on some trials, Finch has shown that young chimpanzees not only have a lower threshold for frustration (a higher frequency of frustration-responses) than adults, but also that their reactions are more violent and explosive in character. One youngster typically resorted to thumb-sucking when frustrated, but most of the younger subjects tended to have temper tantrums, scream, defecate and act aggressively toward themselves, the experimenter, or the animal in the adjacent cage. The older animals were more likely to turn attention away from the experiment, to scratch or groom themselves, or to go to the fountain for a drink of water.

Not much more than a beginning has been made in the definition or determination of "the adequate stimulus" for the various emotions. As in man, emotion appears mostly in social situations. There is no evidence that the infra-human primate "personifies" the inanimate environment. Even when the chimpanzee violently attacks and destroys the problem-apparatus which has proven too difficult, his anger seems clearly directed at the experimenter; such behavior, for instance, is not exhibited towards the water faucet when it suddenly fails to provide water. Once the terminological and epistemological difficulties which have beset this field are cleared away, progress in the investigation of emotion through primate research should be rapid and fruitful.

Individual differences; psychopathology. The range of behavioral variability within a given species of primates is impressively wide. In addition to age and sex differences mentioned under various topics of this article, individual variations in respect to intelligence, drive, emotional threshold, and so on seem to be as great as in man. In a large colony of chimpanzees there are as many "personalities" as there are individuals. Rating scales applied to a group of chimpanzees give a unique "profile" for each animal (Crawford). Differences of temperament are particularly obvious and dramatic but no more important, in research, than the intellectual deviations separating the "genius" from the "imbecile."

Attempts to produce "experimental neuroses" in the primates have been few and thus far have yielded no particularly important results. There are a number of extremely interesting observations of spontaneous (i.e., unintentionally produced) aberrations of behavior. Thus Tinklepaugh has reported the self-mutilation of a male rhesus monkey in a certain sexual-social situation. An adult female chimpanzee showed fear of food in large pieces (much less fear when the food was cut into small bits) over a period of years. Several chimpanzee females have manifested a marked and persistent depression of mood during the years of adolescence. Some of the anomalies of sexual behavior described above would, in man, be designated as pathological. Epileptoid fits have been observed in two infant chimpanzees, and Kopeloff has induced permanent susceptibility to epileptic fits in monkeys by placing certain substances in contact with the motor cortex. The combination of extreme dependence plus sadistic-bullying behavior observed in a young chimpanzee closely parallels the clinical syndrome of one type of "problem child." Inasmuch as the neuroses and psychoses are to a very large extent described in terms of symptoms pertaining to verbal behavior, typical examples of these classical syndromes will not be found among the primates; in view of the limited integrative span and absence of a highly organized symbolic system in these animals (see below) it may be doubted that they are capable of anxieties, paranoid systematizations, and so on, of the intensity and complexity manifested by man. It does seem probable, however, that the basic processes leading to such elaborations may be exhibited in the simpler behavior aberrations of monkeys and apes.

INTELLIGENCE

In any particular activity the organism behaves as a unified whole, with little or no regard for man's abstract analysis of functions, processes, or mechanisms. Only in rare instances, therefore, is it possible to discuss a bit of behavior in terms of a single psychological category and without reference to many other pertinent aspects of behavior. It must be borne in mind, consequently, that in each of the following divisions there is implicit if not explicit reference to topics treated earlier or subsequently.

1. LEARNING AND MEMORY

Learning is an alteration of behavior caused primarily by previous stimulation and response. Memory or retention is the persistence of such alteration. If there is any indication of learning, there is, therein, indication of memory, since the fact of alteration can be determined only by comparison of past and present performances. This inseparableness of learning-retention is especially clear in those experiments in which change ("improvement") is gradual, being measured, for instance, in terms of frequency or probability of correct response. If there is a 50 per cent chance of correct response on the first trial and a 95 per cent chance or frequency on the tenth trial this difference must be the joint product of learning (change due to previous stimulation-response) and of retention (persistence of the change). Most "memory" experiments, however, deal with the longer periods of persistence intervening between the (relative) perfection of a habit or acquired mode of response and a retention test given days, weeks, months, or years later. Obviously one cannot speak of memory in the case of an innately given S-R connection (e.g., a reflex); to speak here of "racial memory" is to point out a superficial, teleological analogy of questionable usefulness.

Memory. As seems to be true of all organisms, including man, "motor memory"—the retention of behavior alterations involving chiefly the acquisition of skills and patterns of motor response, as contrasted to those in which sensory or perceptual discrimination is the critical factor—is relatively excellent among the apes and monkeys. Thus tricks, such as handclapping, everting the lower lip or doing a pirouette (used to solicit food from the human audience), operating a drinking faucet, unfastening hooks, snaps, and padlocks, riding a bicycle, and stage or circus routines, are remembered over long periods of time. Although completely reliable evidence on this point is difficult to obtain, observations suggest that the gorilla and chimpanzee recognize people after absences of a year or longer. There is evidence that thoroughly practiced discrimination habits may be remembered—in the sense of giving initial above-chance scores and being quickly relearned to perfection—over a period of several years.

The most used method for testing memory capacity in the primates is that of the spatial delayed response. Typically the subject sees food being put into one (or several) of two (or more) containers, is removed from the situation (usually by the lowering of an opaque screen), and later is allowed to choose between the containers. Difficulty of the task may be varied by increasing its complexity or the delay interval. In general, the experimental results (Harlow and collaborators, Tinklepaugh, Yerkes) indicate that the anthropoid apes are somewhat superior to monkeys and are not markedly inferior to human subjects. In such comparisons there is always a question regarding the comparability of conditions for the different species being tested, especially in respect to motivation. In working with chimpanzees one gains the impression that with sufficiently strong motivation the delay interval could be extended almost indefinitely.

Discrimination learning. Many experiments have been performed in which primates are required to respond consistently to one of two stimulus-objects, avoiding the other one. Most studies of sensory limens utilize this method. The results in general (there are a few notable exceptions) indicate that primates are rather slow in forming such discrimination habits, not infrequently requiring up to several hundred trials to establish one such habit. Usually choice of the correct object is rewarded (with food) while choice of the incorrect object is unrewarded. Use of punishment for the wrong response has been tried but has not often been found helpful; if at all severe it may result in refusal to work or may interfere with (distract from) response to the critical stimulus. Various factors seem to contribute to this inefficiency of discrimination learning: 1. The prepotency of spatial factors over the cue as determined by the experimenter is suggested by the fact that position habits or spatial patterns of response are manifest during much of the learning period. 2. Fear of the experimental situation may be seen especially in "unsophisticated" subjects and would obviously reduce the efficiency of learning, as would any other distraction. 3. Any spatio-temporal features of the situation which reduce the togetherness or "belongingness" of the response and its consequence reduces learning efficiency. It has been shown that moving the critical stimulus a few inches

back from the place of response (pushing with the finger tips) may increase difficulty of the task enormously. 4. Over- or under-motivation (too much or too little hunger) will attenuate learning efficiency. 5. The chimpanzee sometimes appears to "get his wires crossed," responding consistently to the negative or unrewarded stimulus-object. These factors are discussed further, below, in connection with "integration."

Chimpanzees and some of the monkeys have a relatively small "frustration tolerance" in this type of experiment. If they fail in several successive trials, they may become excited and refuse to continue work. For this reason it has been found advisable to allow correction, in case of error, so that a reward is received on each trial. A brief delay after error, before allowing correction, usually provides sufficient "punishment."

The nature of the stimulus on which the discrimination is based has been investigated extensively, especially by Klüver, using "the method of equivalent stimuli" with monkeys. In such studies the usual procedure is to train the animal until a given discrimination habit has been mastered, and then to vary the stimulus-objects, noting whether the new pairs are equivalent, in the response evoked, or not. The general finding has been that often rather large differences can be introduced without destroying equivalence but that sometimes small changes completely disrupt the consistency of response. A large proportion of the data suggests that primates respond relationally: having learned to choose the larger or the heavier of two objects, they tend to select the larger or heavier of other pairs, differing from the original training pair in absolute values.

Spence has advanced a theory of discrimination learning by which many phenomena, including the apparent response to relations, are explained by the assumption of additive increments of excitatory strength (positive valence) being produced by each reinforced response, whereas increments of inhibitory strength (negative valence) are additively cumulated by unreinforced (non-rewarded) responses. Experimental data have been adduced in support of this theory, which has the great advantages (1) of having quantitative implications which can be put to test, and (2) of offering the possibility of a single, unified explanation for di-

verse phenomena. Its main weakness lies in the fact that, more often than not, the experimenter does not know to which of the potential stimuli in the situation the animal subject is responding; lacking that information, it is impossible to assign the calculated excitatory and inhibitory strengths to any particular stimulus and so to predict what response will occur in subsequent test situations. On theoretical as well as experimental grounds it may be argued that all stimuli are relational in character. Whether chimpanzees respond to that one of two boxes which bears a constant spatial relationship to the other one or which occupies a given "absolute" position, depends on the distance between the boxes; the former occurs if the distance is small, the latter if the distance is greater. Response to so-called "absolute" position, however, is probably response to a position which is relative to background features rather than to the other food box.

The C.R. method of discrimination learning, in which the subject responds to the presence, and refrains from responding to the absence, of a given stimulus (instead of responding positively in each trial to one of two or more stimulus-objects) has been used infrequently with primate subjects. Monkeys have been trained successfully to pull open a door only when certain auditory stimuli occurred (Wendt), and chimpanzees have learned to press down on a telegraph key whenever a tone was sounded (Elder). Eyelid responses have been conditioned in monkeys (Hilgard and Marquis). In all these studies learning was fairly slow and rather similar in its characteristics to that of lower mammals.

Maze learning. Maze experiments, comparable to those conducted with rats in which the animal runs through a series of alleyways, present technical difficulties with the physically larger primates. Only one such study is reported: that of Kinnaman in which two rhesus monkeys required 66 and 113 trials, respectively, to learn a modified Hampton Court pattern. These scores are not significantly different than would be made by rats.

Spragg used stylus mazes with young seeing and blindfolded chimpanzees. The subjects were required to push a stylus manually through a series of channels avoiding those which were blocked by hidden stops. The results show a strong tendency to anticipate the final direction

of response and a lesser tendency to persevere in the opposite direction of the earlier turns. In the balance of these opposing tendencies, the chimpanzees approximated human behavior more than that of rats. A similar anticipation of the final, reward-getting response was gradually eliminated when a chimpanzee had to push in three pegs and pull out the fourth. Following bilateral extirpation of the frontal areas, the tendency to anticipate the pulling response reasserted itself more strongly than before (Jacobsen, Wolfe, and Jackson).

2. LEARNING AND PERCEPTION

In the learning experiments described above the subjects were confronted by a "blind" situation. There is no way—unless it be mind-reading!—that the animal can know beforehand the consequences of its alternative responses: whether the experimenter has decided to reward response to triangle or to circle, to black or white, whether this or that pathway is blocked. In such a situation all that any organism can do is to try out the possibilities, to use the method of trial and error. As indicated above, the infrahuman primates do not appear markedly superior to the lower mammals in the application of this method. By contrast, man apparently can make better use of his initial successes and failures and so can attain the solution to a "blind" situation more rapidly. The principal exception to this rule is when the cue, the differentiating stimulus, is strictly positional, in which case the performance of monkeys and apes approximates that of man.

Human behavior is characterized by immediately adaptive response to a great variety of situations, many of which may be quite novel in the sense that their details vary from any situation previously experienced. They are not "blind" however in the arbitrary way of a maze, which may be of any conceivable pattern. They are, instead, situations which allow one to "see" the solution: a wire fence in front of the goal must be circumvented to get to the goal. They permit "insight"—they do not (typically) require overt trial and error. If the efficiency of blind learning distinguishes man to only a modest extent from the rest of the animal kingdom, the frequency and range of insightful problem solutions sets him far apart. The bases for such immediate solution have not been thoroughly analyzed. Certainly they

are many rather than one. A satisfactory description, categorizing, and ordering of the mechanisms or processes involved is the fundamental problem of intelligence—human and comparative. We may suppose that differences in innate perceptual organization, in the ability to abstract and to integrate past and present elements of experience (see below), and in the availability of a highly organized symbolic system, are among the factors involved. Starting with Hobhouse, followed by Köhler, Yerkes and many others, a variety of problem situations have been devised to test this capacity for immediate "understanding." (In the attempt to control for obvious differences in experience, particularly with certain types of materials, considerable ingenuity has been displayed in devising situations which would be "fair" to the organisms being tested. Quite often, when a problem was not solved by insight, it was used as a learning situation; certain types of problem boxes, for instance, illustrate such diversion from the original aim.)

Problem boxes. The name "problem box" has been applied to such diverse situations as a lever whose depression for no reason understandable to the animal subject results in delivery of a bit of food, to those in which the animal has merely to remove a lid in order to get at the reward. What is usually measured in problem-box experiments is the animal's persistence, variety of trial responses, how well it profits from successive experiences and successes, and finally the "transfer effects" from one problem box to similar ones, particularly the ability of the subject to respond on the basis of a mechanical principle, such as that of the lever. The Jenkins problem box is designed especially to investigate learning; three discs must be stepped on in patterns becoming increasingly lengthy and complex. The "limits of capacity" in terms of the average number of steps learned are scored as follows: cebus monkey, 9.8; rhesus monkey, 7.4; kitten, 3.6; rat, 0.9; guinea pig, 0.5 (Koch, Fjeld, Shuey, Riess). If the learning of a principle is involved here, it is merely that pressing down the circular discs has something to do with attainment of reward. Because of manual dexterity and freedom of the hands from the function of supporting the body, the primates are more successful than other animals in coping with various types of opening devices (Hobhouse, Köhler, Yerkes, Thorndike, Kinn-

man, Kohts). In general they improve with practice and from one problem to the next. How much such transfer is the result of grasping a principle and how much of reduced fear, greater attention to certain features, and so on, is rarely clear.

String tests. In the patterned string test the subject is first trained to pull in a string, to the further end of which a lure is attached. The animal is then confronted with a series of situations in each of which there are usually two strings, one with food attached and one or more without food. The strings are laid out on a platform in various patterns, the correct and incorrect strings being more or less easily distinguishable. Visual acuity obviously is a factor in the performance, as are impetuosity *versus* deliberateness of choice and attention to visual details; whether any "higher" functions are tapped by this test is open to question. It appears that chimpanzees may be slightly superior to monkeys in patterned string problems and that the former profit more by practice. One study suggests that spider and cebus monkeys are a little better than rhesus monkeys. That all tested infrahuman primates show considerably less accuracy in this test than man, and are superior to all infraprimate animals, seems unquestionable.

Use of sticks. Just what constitutes the critical difference, psychologically, between the ability to draw in a string, stick, or board to which the lure is attached, and the ability to use a stick as an extension of the arm to rake or sweep in an unattached piece of food, is not clear. The former task is solved quite readily by monkeys and apes, while the latter involves considerable difficulty and usually is solved only after much random activity with initial success being "accidental." Observations in the field indicate that chimpanzees pull or bend branches and twigs so as to bring the attached fruit within reach of mouth or hands; this would be analogous to the string-pulling experiment. Nothing has been reported indicating that the wild chimpanzee uses detached sticks in purposeful, instrumental ways. Serious fighting, for instance, is done directly with teeth and limbs; the use of clubs in combat has not been reported. Jackson and Birch have shown that young chimpanzees improve in their adaptive use of sticks after opportunity to play with them in non-goal-attaining activities. One of six

young chimpanzees living in an enclosure containing several trees, spontaneously (i.e., without human tuition or encouragement) developed a high degree of skill in using broken off branches, poking them through the wire of the enclosure to open door fastenings, to operate an electric light switch, and even to screw an electric bulb off and on in its socket. Needless to say, this animal gave an outstanding performance in formal tests of stick-using ability. The evidence in general indicates that experience plays an important role in developing the instrumental use of sticks and that the critical perception of the stick as a possible extension of the arm is built up gradually rather than being given in the innate organization of the visuomotor field. The demonstration that experience is an important factor here does not in itself invalidate the use of "insight" in accounting for the total behavior—it merely reduces the scope assigned to the insightful process. Once the animal has used a stick in attaining a goal, there seems to be considerable transfer to other objects and other situations. That is, if a stick is not available, a newspaper, wire, or even a bundle of straw may be used in place of it; a stick formerly used to open a door fastening will be used quite readily to sweep in a piece of food.

The meager data available suggest that certain monkeys (e.g., cebus) are better in stick using than others (e.g., Java and spider monkeys). Present information suggests that the limits of training may be higher for chimpanzees than for the other anthropoid apes and monkeys.

Complicated stick problems. The problem of obtaining food by use of a stick may be complicated in various ways. By placing low barriers between the lure and the animal, the subject may be forced to move the food laterally, or directly away from itself, before the lure is free of the obstruction and ready to be swept in. These indirections (Umwege), especially the latter form, present much difficulty to primates. Chimpanzees appear to be superior to monkeys in this problem. Observation of chimpanzee behavior in this situation suggests that the difficulty may arise not so much from perceptual failure—that is failure to "see" the correct or only possible pathway—as from an overwhelming compulsion to bring closer, rather than push away, a desired object. A sec-

and complication is to have the stick out of the immediate situation; it is available but not actually in sight when the lure is in sight. Here one of the elements critical for the perceptual organization must be supplied by memory, memory of the stick previously seen but not present to the senses at the locus of the necessary final response. There is good evidence that, after ample familiarity with the several components involved, the chimpanzee is able to draw such a "mental" item into functional contact or unity with the immediately present situation, thus attaining what some authors would term a "reorganization of the psychological field." A third type of complication is to have immediately available only a short stick too short to reach the lure (Köhler, Guillaume and Meyerson). With the short stick, however, the animal can draw in a longer one, with which it can reach the food. The series, of course, can be extended to three, four, or more successively longer sticks. This problem has been solved by chimpanzees and by a cebus monkey. Usually the adaptive sequence of drawing in the long stick with the short one and then using the former to get the lure is preceded by unsuccessful attempts to use the immediately available short stick for reaching the food. The difficulty of this problem for chimpanzees is increased if the lure and all the necessary sticks are not together where they can be viewed simultaneously; that is, if at least one of the sticks is located at a distance from the lure. Under these circumstances the normal animal succeeds, whereas the chimpanzee with bilateral extirpation of the frontal lobes of the cortex fails utterly (Jacobsen, Wolfe, and Jackson). This finding supports other evidence regarding the function of these cortical areas; they appear to be necessary in integrating an item present only in memory with the immediate situation.

The tube and stick problem presents something of the same conflict of reaction tendencies as does the pushing away of the lure in order to get it free of a barrier. Here the lure is placed inside of a fairly long opaque or transparent tube (made of wood, pipe, glass, or wire netting) which is too small in diameter, or too long, to permit the animal to reach in with hand and arm. A stick is available, the problem being to use it to push the food out of the tube. This problem is extremely difficult for

monkeys and apes; those successes reported usually occurred only after extensive training.

Suspended lure and box stacking. As in the case of stick using, no behavior analogous to box stacking has been reported for the wild chimpanzee. Climbing or stepping up in order to reach overhanging food is common enough and requires no special training beyond that afforded any active animal in a native or usual laboratory environment. Pushing around unattached objects, such as boxes, chairs, or tables also is a "natural" activity. Thus it is not surprising that the suspended lure problem, which requires that a box or stool be placed under the point of suspension so that it can be climbed and the lure be reached, is solved fairly readily by chimpanzees and some monkeys. According to report, a certain amount of "random" activity with the box or stool usually precedes solution. Chance alone, however, does not seem to be responsible for getting the box in the correct position; quite suddenly, often, the box is pushed directly to the correct spot. Given certain elements: the lure suspended out of reach, the experience of climbing upon a box to reach such a lure, and the presence of a box or stool known to be moveable, a perceptual integration of these elements, a "structuring of the field," occurs by which the pathway to the goal, with the placement of the box under the lure as the first step, is perceived.

A similar, sudden perceptual organization occurred in a suspended lure situation described by Yerkes. "Two boxes were available, neither box alone giving enough height to reach the food. The subject was Soda, a seven-year-old chimpanzee. For the first forty minutes she made no detectable progress toward solution. . . . she now pushed the larger of the two boxes nearly under the banana, and going to the other box, which was near by, jumped from it toward the banana repeatedly but without success. Then she leaned for a moment against one corner of the experiment room, looking toward the banana. The larger of the two boxes was still almost directly under the banana and the smaller only a few feet away. Suddenly Soda stood up, walked directly to the smaller box, lifted it in her hands, placed it upon the larger box, and mounting the structure jumped toward the lure, reached and secured it. It was only a few seconds from the

moment she started toward the smaller box until she had the banana."

Numerous instances of successful box stacking have been reported for chimpanzees, with as many as four boxes being used (Köhler, Yerkes, Bingham). The gorilla and orang appear somewhat less adept in this performance (Yerkes). There has been only one report (Bierens de Haan) of success in box stacking with the lower primates, a cebus monkey being the subject in this case.

Other instrumental problems; tool-making. A variety of other instrumental problems, some of them highly ingenious (the hooked-rope problem, Bingham's channel apparatus, and many others), which have been set for primates, show essentially the same type of ability already illustrated or are somewhat difficult to analyze in terms of the psychological functions involved.

Just what constitutes tool-fabrication is obscure. Liberally interpreted, it might well include the use of boxes and sticks as already described, or in pole vaulting and pole climbing. Perhaps it should refer to performances such as the breaking off of a branch of a tree or the freeing of an iron bar, as described by Köhler for chimpanzees, in order to obtain an instrument for further purposes. The nearest thing to the manufacture of tools in the ordinary sense seen in primates is the observation reported by Köhler of a chimpanzee fitting together two short sticks in order to make a long one. This observation has not been repeated.

Imitation. The problem of imitation has long attracted the interest of students of primate behavior. Imitation is of obviously great importance in human learning and superficial observation, at least, suggests that it plays an influential role among the lower primates, as attested by our verb "to ape." Uncertainty as to just what constitutes "imitation" and the fact that the term has meant different things to different writers are responsible, at least in part, for the divergencies in results reported by the early investigators, most of whom used monkeys in their experiments. Warden and Jackson proposed five criteria for "imitation" and devised a special apparatus by which they could be met. Many of their tests gave positive results, indicating the capacity for imitation in rhesus monkeys. Elaborating the viewpoint of Watson,

Spence points out that even these findings may be interpreted as reflecting merely an "enhancement of the stimulus." More recently Crawford and Spence experimented with chimpanzees on the possibility of imitational learning of discrimination problems in which "enhancement" was eliminated as a critical factor. Positive results were obtained (1) in 5 out of 8 cases when the situation forced or encouraged the imitator to orient differentially towards the correct stimulus, to which the demonstrator made a positive choice response, (2) in 2 out of 7 cases when the imitator's overt orientation, necessary to obtain a reward, was to a point midway between the positive and negative objects, and (3) in at least one out of 11 cases when the situation provided no reward and minimal encouragement for a differential orientation by the imitator. The latter results provide good evidence for imitation, rigidly defined, in chimpanzees. The authors' suggestion that "the eating of food by the demonstrator may have served as a *substitute reward* for the imitator" may be questioned. To those well acquainted with chimpanzee behavior the experimental evidence for imitation is not surprising. The following is only one of several similar observations that might be cited. In the course of routine care the chimpanzees at the Yerkes Laboratories have ample opportunity to see the men using a key to open padlocks and door locks. On one occasion an adult female took a bunch of keys out of the coat pocket of an attendant while he was in her cage. The animal at once selected a key and rather awkwardly tried to insert it in the keyhole of a window grille. It was the wrong key. Efforts to get the keys back from her met with a gentle but firm refusal. She next applied the correct key to the door lock. After half an hour of exploration outside, her interest in the keys was diverted and she was lured back into her cage. It is almost certain that this animal had not had previous experience in the use of keys.

3. ABSTRACTION AND INTEGRATION

Generalization and abstraction. Having learned to respond in a given way to one situation (key depression with a certain tone; choice of the larger of two white boxes), an ape or monkey will make equivalent responses in certain other similar situations (key depression to tones varying from the original in pitch,

loudness, purity; choice of the larger of two black boxes or of two boxes differing in absolute size from the training pair). Such phenomena are usually called "generalization." With sufficient training, chimpanzees will come to respond consistently to a given form under a great variety of circumstances, including changes in background, in rotation and size of the figure, and in the characteristics of the alternative with which it is paired. Such a performance is often termed "abstraction." The difference between generalization and abstraction as thus illustrated is obviously one of degree rather than of kind, the latter being more difficult. The reasons for the difference in difficulty may be analyzed into three factors: (1) The greater the difference in the context in which the cue or critical stimulus appears, the greater or more likely will be the disruption of the response. The more the antecedent (situation) varies from the original, the greater the probability of the consequent (response) varying, to use Hollingworth's terminology. The effects of the parts of a situation are, roughly, additive. (2) Partly because of experience but mostly because of genetic constitution, different stimuli are more or less obvious, obtrusive, and compelling for any given organism. As Klüver has pointed out, what is obtrusive for one species may be most obscure for another; two stimulus-objects lie on a given dimension for one animal but may not be on that same dimension at all for another organism. For all primates, for instance, there appears to be a visual size dimension, but such dimensions as number, triangularity, and middle-ness are difficult, obscure, or even non-existent for most. Many dimensions or groupings of stimuli, as a matter of fact, seem to be impossible without a language or language-like system of symbolic processes. (3) Even in a simple two-choice situation there are usually many differences, rather than one, between the alternatives: in the case of two white squares differing in size, there is difference in total illumination, in area, in horizontal length, vertical length, length of the diagonals, and, usually, in nearness of the edges to fixed landmarks of the background. The animal subject may solve the problem by responding to any one of these—it doesn't know which of these features the experimenter may be thinking of in devising subsequent tests. Thus there is a premium on attention (response) to all differ-

ential features; the more inclusive the response, the more likely will be "positive results" in the tests for abstraction.

Multiple choice. In the multiple choice method of Yerkes the correct response is to that one of several boxes, or compartments, identical in appearance, which bears a constant spatial relationship to the others. Thus the positive box may be the left-hand one of a variable number, or the middle one of 3, 5, 7, or 9 boxes whose absolute position in space varies from trial to trial. The former, end-box problem, is learned readily—more quickly, as a matter of fact, by the pig and crow than by various primates. Especially in the apparatus used, which accentuates the position of the alternatives to each other rather than to a background feature, the stimulus, "left-end box," is apparently an obtrusive one to which the animals respond easily and naturally. The stimulus "middle box," by way of contrast, is not obvious to animals below man and presents great difficulty. With the original technique of varying the number of boxes from trial to trial, four chimpanzees as well as a monkey and two pigs failed in this problem. By keeping the number of boxes constant at five, and using only four different settings of 11 boxes, Spence obtained solutions of the middle box problem in all of 17 chimpanzee subjects, very young animals learning about as readily as adults. The technique of using a constant number of boxes makes this problem easier (1) by reducing the contextual differences in the situation and (2) by reducing the number of possible cues to which the subject might respond and from among which the correct one must be selected. In the analysis of his data Spence indicates the probability that five of the chimpanzees "adopted a generalized mode of solution" whereas the other twelve "learned each specific setting of boxes separately." This may be interpreted as meaning that the latter subjects perhaps never did respond to the cue "middle box" but may have responded, for instance, to each of four "absolute" positions depending on the context (setting) used.

Figure-ground; oddity. Novel objects, insofar as they do not inspire fear, are closely and minutely examined by monkey and ape. Observation reveals that it is the irregularities in the object that receive the closest inspection: cracks or spots on the wall, small blemishes on the

skin, the seam on a rubber ball. It is the figure, and not the homogeneous background, which gets attention. The natural response to what is different is exploited in the discrimination method variously called "strata stimuli," "unequilibrated" or "non-equated stimulus situations," and "oddy method." If response to oddity were completely prepotent over response to other stimulus dimensions, it would be possible to test the entire range of discriminative capacity of an animal in a relatively short time and without the usual laborious procedure of training required by the conventional techniques. A comparison of the "equated" (one positive and one negative stimulus-object) and the "non-equated" (one positive and 9 or 11 similar negative stimulus-objects) methods, as used with chimpanzee subjects, showed that although there is an initial propensity to select the odd (positive) object, this is not completely prepotent over other response tendencies. From the beginning, however, the non-equated situation is more efficient, presumably because the natural response to oddity augments the effects of the arbitrary rewarding of that object having certain properties, specific and relative to those of the "negative" objects. It is interesting to note that oddity was more effective with intrinsically more discriminable objects (colors) than with less easily discriminated objects (patterns). That response to features other than oddity was strengthened by training is shown by the negative transfer manifested when positive-negative values of the stimuli were reversed. Such negative transfer, however, was reduced almost to zero when reversal occurred by or with the technique other than that used in the original training. That is, with a marked change in context past learning was less effective and change to another basis of response (e.g., from specific properties to oddity) was easier. As these chimpanzees were trained in a series of discriminations with the non-equated method, they came to respond more and more to the feature common to all the problems: the oddity of the positive stimulus-object. The training necessary for evidence of discrimination therefore became progressively shorter. It was found, however, that after the subjects responded immediately to the odd color of any color combination they did not at once select the odd pattern of various pattern combinations. The oddity method has been applied with great

success by Harlow and his associates in an extensive series of experiments with monkeys.

The matching method. The matching-from-sample method also offers the possibility of a short cut in testing for discriminative capacity but seems to require much more preliminary training than does the oddity method. The task of the subject is to select that one of two or more objects which is like the sample presented. The stimulus, "similarity-to-sample," is not one to which primates respond naturally, as they do to a figure-on-ground or what-is-different. It is clear, however, that once response to this stimulus has been established, tests of discriminative capacity may be conducted quickly and efficiently. Kohts obtained much information about her chimpanzee subject with the matching method and the Wisconsin group of comparative psychologists have used it extensively and fruitfully with monkeys. Weinstein has employed it as a sorting or "color categorization" method, having the monkey subjects respond to several objects matching the sample in hue (but differing in size, shape, brightness and saturation) while refraining from response to other objects differing in hue from the sample. This is an excellent example of abstraction as defined above. By maintaining a constant shape for the color-samples (triangle-red, ellipse-blue) over a long training period, this investigator succeeded in getting one monkey to pick out only red objects when the sample was an uncolored triangle, blue objects when the sample was a colorless ellipse. "The color categorizing performances indicate that in the course of training the subjects developed concept behavior towards red and blue objects." Conversely, the subject selected the achromatic triangle or ellipse when the sample object (of various shapes) was red or blue. "Since this stimulus-response pattern is the converse of selecting a colored object in response to a symbolic cue it is termed *converse symbolic behavior*."

Integrative span. It has been indicated above that an animal's range and flexibility of attention (number of elements to which response is made) influences its success in abstraction. Many life situations put a premium on the organism's ability to respond *simultaneously* to a number of distinct features: A is edible if it is also B₁ and C₁ but not if it is B₂ and C₂. A

number of experimental problems illustrate this integrative capacity and suggest that species may differ widely in the complexity of the "if W and if also X and Y, then Z" function which they can attain. In one study young chimpanzees mastered the following set of two-choice problems:

- (1) If the squares are equally small, then the white one of the two is correct.
- (2) If the squares are equally large, then the black one of the two is correct.
- (3) If the squares are equally white, then the large one of the two is correct.
- (4) If the squares are equally black, then the small one of the two is correct.

Under very similar experimental conditions rhesus monkeys failed to solve both of the first two problems, a gibbon mastered the first two but was unable to add the third and fourth to the complex, while cebus monkeys were able to master three of the four (Galt). In a further study with an adult chimpanzee, a dozen interrelated habits were learned, the only difference between the two objects presented on a given trial being one of size. Whether the larger or smaller one was correct depended on its color (white or black), shape (square or triangle), patterning (whether or not it had a pink margin), and presence or absence of a small green peg in front of each object. Other than position (the positive object might be to the right or left), therefore, correctness depended on five cues—disregard of any one of these would lead to failure (50 per cent errors). The addition of the fifth necessary cue caused marked difficulty and, under the particular conditions of experimentation, may mark the limits of chimpanzee capacity. It is interesting to note that this animal did not respond to the generalized meaning of a given cue, as would be dictated by the interests of efficiency. In the first four habits, for instance, none of the objects had a margin. In these four problems the correct objects were: large white square, small black square, small white triangle, large black triangle. With margin added all these objects became of negative value (were unrewarded). But instead of learning the four new habits simultaneously, as might have been the case if the margin had been responded to as "reverse

of previous valence," each pair was learned separately.

Working with spider and cebus monkeys, Lashley presented a series of 25 discrimination problems and their reversals. The original habit always involved a plain background, the reversal a striated background. Before going on to a new pair, a criterion of 40 correct responses, with the stimuli appearing on plain and striated backgrounds in random order, was required. The monkeys never learned to respond promptly to the background-difference as a sign of reversed stimulus values when successively new discrimination-pairs were presented, although the spider monkey did get to the point of making a chance score (instead of 100 per cent wrong) when the background was changed from plain to striated on a newly learned pair of stimuli. In another unpublished study Lashley gave a spider monkey 116 discrimination problems, in each of which the correct stimulus-object contained two like figures (e.g., two squares) while the incorrect one was marked by two unlike figures (e.g., a square and a circle). Learning was quite rapid on all 116 problems, but no better at the end than at the beginning of the series. That is, the monkey did not abstract the cue-dimension of similarity-dissimilarity from the diverse contexts of the varying figures used.

Harlow and Spact have reported studies indicating considerable ability on the part of their rhesus monkeys to integrate a number of elements. Their procedure is such that a direct comparison with the last-described chimpanzee experiment is not possible. The animals mastered the following set of habits, in each of which three objects were presented for choice:

- (1) With a yellow background the odd object (of two like and one unlike object) is correct.
- (2) With a black background the non-odd objects (of two like and one unlike object) are correct.
- (3) With a yellow background and 3 buttons available, the left-hand one is correct.
- (4) With a yellow background and 3 T's available, the right-hand one is correct.
- (5) With a black background and 3 buttons available, the right-hand one is correct.
- (6) With a black background and 3 T's available, the left-hand one is correct.

Considering the first two habits, it is clear that the subject must respond to background color and oddity. In the last four the subject must attend to background color, nature of the objects (electric push buttons *versus* T-shaped blocks), and position (rightness *versus* leftness). The question arises as to how many cues must be integrated when all six habits are mastered simultaneously. If we assume that the subjects approached the situation with a set (prepotent readiness) for responding to oddity *versus* non-oddity (as might be expected from the circumstance that they learned this first), then the mere fact that no oddity stimulus was present (in the last four problems) would be enough to eliminate this possibility and would make it unnecessary to respond to the pattern difference (2 of one kind, 1 of another *versus* 3 of a kind) as a cue. If this assumption is incorrect, Harlow and Spaet are right in considering configuration a fourth variable. At any rate it is clear that rhesus monkeys have a very considerable integrative span. In further work these investigators showed (1) that extirpation of the prefrontal cortex reduces this capacity in the rhesus, and (2) that two cues of different modality may determine response (choice of a T at sound of buzzer, of a push button at the sound of a bell).

Behavior plasticity. Various examples of both plasticity and inflexibility have already been noted incidentally. A few experiments have been designed especially to examine this aspect of behavior which, of course, is involved also in the above discussions of integrative span and the inclusiveness of response to the variety of potential stimuli in any situation. Hamilton tested human adults and children, monkeys and lower mammals with an insoluble problem, the subject being allowed to select one of four spatially differentiated possibilities. The only rule followed in determining correctness was that the same one of four doors was never correct on two successive trials. He found that man gave the highest, monkeys the second highest, proportion of "inferentially correct" responses: avoidance of the door which was open (correct) on the preceding trial. The number of possible cues which might designate the correct choice is relatively huge, and the problem is further complicated by the fact that a "correct" response involves one frustration on a third of the trials and two frustrations on another third;

rewarding occurs on the first attempt in only one-third of the trials guided by rational inference. The latter requires that the subject remember the open door of the last trial and respond to "something different."

Goldstein and others have stressed the significance of the ability to shift attention rapidly from one to another aspect of a situation in psychiatric and neurological patients. This ability has been tested in monkeys by the oddity and matching-from-sample methods (Harlow, Young, Simpson). Rhesus monkeys were successfully trained (1) to select that one object of three which was odd in respect to color when the objects were on an orange-colored board, and that one of the same three which was odd in respect to form when they were presented on a cream-colored board, (2) to select that object which matched the sample in respect to color when the sample was rewarded and to choose the one matching the sample in respect to form when the food-well under the sample was empty. The latter performance was possible even when a delay of 10 to 14 seconds intervened between contact with, and sight of, the sample and opportunity to respond to the choice objects.

4. TEMPORAL INTEGRATION

It is obvious that most if not all instances of intelligent behavior considered thus far involve the integration of past and present elements of experience. The present section deals with experiments (and theorizing) bearing more directly or analytically on the problems of temporal integration.

Double alternation. The double alternation problem has considerable theoretical interest since, according to Hunter's original analysis, its performance involves the use of representative factors or symbolic processes. The subject is required to respond twice to right, then twice to the left, and so on: R R L L R R . . . Since the external stimulating situation is the same after the first L-response as after the second, what cue can the animal use to make an L-response in the first instance, an R-response the next time? The assumption is that the differentiation is made through self-stimulation by a process analogous to counting. Gellermann found that rhesus monkeys could master the sequence: R R L L R R L L and could then extend the series to 12 to 16 responses. The

evidence for a symbolic process in this case is not too convincing, however, since the responses were made at a rapid and fairly uniform rate; there is other evidence that the effects of an S-R last or reverberate for several seconds (or longer), so the possibility exists that stimulation after the first L included after-effects from turning from R to L, whereas following the second L-response such after-effects had greatly diminished or disappeared.

"Counting"; the temporal maze. Several "counting" experiments with monkeys have been reported, a few of which claim positive results. The evidence that anything more than distance perception, response to moreness, or to secondary cues was involved in these studies, is questionable.

Spragg attempted to train young chimpanzees on a "temporal maze" using the response pattern, R R R L. As in double alternation, the external stimulating situations are exactly the same just before all but the first R responses and before the L response. After extended training two of the subjects were able to perform correctly (without any error) in some 31 to 48 per cent of the trials; most of the errors made were anticipations of the final L response.

Delayed reward. There is no evidence that any organism below the primates can form an association involving non-spatial cues if the consequences (actual, or signified as in delayed reaction) of the response follow it by more than a few seconds. Riesen, working with chimpanzees, found that his control subjects could not learn a red-green discrimination habit if rewarding (or non-rewarding) occurred more than 4 seconds after selection of one of the colors; delays as short as 1 or 2 seconds retarded learning markedly in comparison to the no-delay condition. The experimental subjects, however, who previously had been overtrained on a series of color discrimination problems requiring consistent choice of the longer of two wave lengths, learned the red (positive) *vs.* green (negative) and green (positive) *vs.* red (negative) habits much more quickly and performed equally well with reward-delays of 16 or 20 seconds as with shorter (including zero) delays. This finding is interpreted as indicating that a delayed reward can be effective in modifying behavior (producing learning) only if the subject has readily available, consistent responses which are differential in respect to the

critical stimuli (red-green). Otherwise "the cue is lost to the organism."

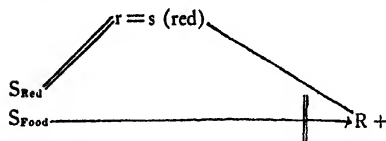
Delayed response. The delayed response problem is a special case of discrimination learning, with emphasis placed on retention rather than on acquisition of the behavior modification. It is a special case in that (1) learning takes place in one rather than in several trials, and (2) reinforcement of the learning is merely signified, the actual reward being given only after a successful learning-retention performance. Since many learning-retention units can be given in a short time, the method is an efficient approach to the study of factors affecting behavior modification. It provides, furthermore, certain unique possibilities for behavior analysis.

In the first place we have the striking fact that monkeys and apes manifest a very marked capacity for delayed response when the cue is spatial or positional but have great difficulty with the problem when the cues are non-spatial in character (*vide supra*). With chimpanzees it is initially almost an all-or-none difference. In a number of experiments, employing a variety of modifications of technique, chimpanzees have demonstrated their ability to do delayed response with non-spatial cues, but usually only after prolonged training and rarely at delay intervals over 30 seconds or with an accuracy greater than 80 or 90 per cent. Experiments reported from the Wisconsin laboratory indicate that rhesus monkeys performed in this task with an accuracy of around 85 per cent at delay intervals of 12 seconds. With both monkeys and chimpanzees an approach to delayed response has been made via a series of discrimination problems, with stimulus-objects changed or stimulus-values reversed, from one to the next; the number of errors before mastery tended to decrease with continued training, in some cases dropping to the theoretical limit of 0.5 errors per habit. This technique was more successful with the monkeys than with the apes, possibly because many different stimulus-object-pairs were used with the former, whereas only one pair, with stimulus-value reversals, was used with the chimpanzees, possibly because of the use of stereometric objects which the monkeys actually handled *versus* the use of planometric stimulus-objects which were merely pushed back by the chimpanzee subjects. Improvement shown by the monkeys was quite sudden: during the first five (difficult) problems the aver-

age error score was 24.3, dropping to an average of 0.97 on the next 36 (easier) problems. From one-trial learning—that is, mastery after a single rewarded or unrewarded experience—it is only a short step to delayed response, in which the designation of the correct alternative is indirect rather than direct.

The very marked difference in difficulty of discrimination learning and delayed response when spatial or non-spatial cues are involved may be one of degree: the spatial cue obviously has prepotency and, since any stimulus-object must appear somewhere in space, the subject may continue to respond to its spatial aspects to the exclusion of, say, its visual characteristics. Once the animal has "restructured" the situation—has focused its attention on the visual dimension—delayed response to non-spatial cues should become as easy as to spatial cues.

Another possibility, originally suggested by Hunter, is that quick (one-trial) learning involves a different mechanism or process than does slow discrimination learning. This might be similar to the symbolic process suggested above for learning with delayed reward, and would be diagrammed as follows:



At the beginning of the trial the successful subject makes its ready-made symbolic response to "RED" and this becomes associated with the forward-going (positive) tendency whose overt expression is, at this time, blocked by the external situation (vertical lines). Such an association is not formed with the green box, since this is not designated as containing food. At the end of the delay interval, the obstacle having been removed, the red stimulus sets off an associative chain leading to a positive response. According to this hypothesis the primates (and probably some of the lower mammals) have developed symbolic (implicit, differential) responses to spatial but not to non-positional cues. Some of the chimpanzee experiments lend plausibility to this formulation by showing, for instance, that animals who first have learned to make different movements in response to red and green (lifting a handle for red, depressing

a lever for green) subsequently are more successful in red-green delayed response than those who did not have prior training in making such differential movements.

The second feature which was listed above as distinguishing delayed response and certain types of so-called insightful (immediate) problem solutions from multi-trial learning situations is that in the former the subject does not actually obtain a reward until after the correct, errorless response has been made. That the kind and size of incentive employed affects the intensity and nature of the effort made to obtain it has been demonstrated experimentally. The term "expectancy-value of the incentive" has been used to designate the function of the lure in affecting behavior occurring before it has been obtained. A fairly specific expectancy is indicated by Tinklepaugh's observation that monkeys, accustomed to receiving a given kind of reward in delayed response trials, showed signs of frustration, disappointment, and searching behavior when a less preferred food was substituted. Still greater specificity of the expectancy aroused by the particular incentive used on a given trial is indicated by the fact that chimpanzees performed with greater accuracy on large-incentive than on small-incentive trials even when these were randomly alternated. The expectancy aroused by a certain lure or reward-sign must itself be reinforced or confirmed: when a medium-sized reward was always given for correct response, regardless of whether a large or small incentive had been shown at the beginning of the trial, the difference in accuracy of performance under the two conditions gradually disappeared. In some unpublished experiments with chimpanzees it was found that the incentive effects on accuracy scores could be reversed by consistently giving large rewards for correct response on small-lure trials, small rewards for correct response on large-lure trials. The fact that the animals can learn that a large incentive "means" a small reward implies that they integrated the two events (sight of a large piece of food, reception of a small piece) which were temporally separated by length of the delay interval, ranging up to two minutes and longer. Symbolic processes, that is, implicit responses differential for large and small incentives, would provide a possible mechanism for this temporal integration.

PHYLOGENETIC COMPARISONS AND EVALUATIONS

Details of phylogenetic relationships among the primates, and of the primates to other mammalian orders, are uncertain. Behavioral and physiological criteria, thus far given scant attention by the taxonomists, are not always consistent with morphological data but may prove extremely useful in tracing the course of primate evolution (Zuckerman). It seems probable that various groups of primates have followed separate lines of development from early times in the history of the order, but which of the extant forms are closest to the direct line of human descent is unknown. As to the relatively immediate future, man seems to hold the greatest promise of further advance. The specializations of the other primates (e.g., brachiation in the gibbon, large size in the gorilla) have the features of dead-end stopping places, whereas man's large and "plastic" brain is perhaps less a specialization than a potentiality for further development along a new dimension of progression: a development which, instead of proceeding by germinal variation and mutation, progresses by the pyramiding of cultural accretions.

If we include man in our comparisons, the range of behavior variations within the order of primates is enormous. Even excluding man, the differences in intelligence from tarsier, lemur, and marmoset to the anthropoid apes are perhaps as great as those among all the other mammals together. Judged by our present knowledge, there are rather few significant behavioral advances from some of the marsupials and insectivores to the most primitive primates. This diversity in regard to many aspects of behavior within the order of primates deserves emphasis.

Man's upright posture together with his manual dexterity gives him a decided advantage over all other creatures in fashioning the environment to his needs. When this ability is directed by human intelligence in the fabrication of tools, machines, instruments, and materials, man's control of nature becomes almost incomparable with that of other members of the animal kingdom. What is "human intelligence" and how does it differ from infrahuman intelligence? Those two questions are inseparable, and the fact that the analysis of either one inevitably furthers our understanding of the other is basic

to the rationale of comparative psychology. Until analysis has defined the dimensions and the measuring units of intelligence, of mental evolution, differences can be stated only in crudely descriptive terms, in words referring more to "practical" end-results than to processes. Recognizing, and for the moment accepting, the incompleteness and imperfections of present psychological analysis, we may indicate certain broad differences and similarities which emerge from a comparison of the most highly developed infrahuman primates (the anthropoid apes and some of the monkeys) with man on the one hand and with some of the lower animals (especially the remaining mammals, birds, and insects) on the other:

The relative frequency of innately determined, uniform behavior sequences in adjustments of the organism to its environment is definitely less in the higher primates than in other animals, slightly greater than in man. What might superficially appear as the corollary of this, namely that learning plays a relatively greater part in day-to-day activity among the phylogenetically higher organisms, seems less certain. The most significant change is in the nature and diversity of what is learned. The speed of learning is greatest in man, but that it is usually greater in the monkeys and apes than in some of the lower animals has not been proven. Perceptual scope, the number and diversity of relationships which are or may become stimuli, is much wider than in the infra-primates, much more restricted than in man. In respect to inclusiveness or comprehensiveness of response to the various aspects of a situation, the higher primates again occupy a midway position. This is true also of integrative span, the ability to base a given response on a combination of factors (stimuli), and to bring past experience into relationship with the present situation.

It is reasonable enough to suppose that phylogenetic differences in emotional expression, in attitudes and goals, and in forms of social interaction, are the direct result of differences in intelligence or that both sets of variation are co-derived from a more basic alteration. The chimpanzee, for instance, seems to have all the primary emotions that we know in man, but his expression of those emotions is more simple and direct. His basic drives are the same as man's and he exhibits "functional autonomy of

motives" only to a lesser degree of complexity than does *homo sapiens*. His sensitivity to social stimuli is possibly greater than ours; the fact that he has not developed a highly organized society with specialization and division of labor, teamwork, and so on, may be ascribed to his intellectual equipment, his lack of a language for communication, and perhaps in part to the absence of an urgent, environmentally imposed necessity.

Man's behavioral superiority has two significant accompaniments: (1) an absolutely and relatively large brain, particularly in respect to the cerebral cortex, and (2) a highly complex, conventionalized system of symbolic processes (language). The former may well be the necessary basis for the latter and, directly or indirectly, for man's advantage in the several aspects or dimensions of intelligence outlined above. From this viewpoint psychoneurology, the investigation of the neural correlates (quantitative, topographical, and physiological) of behavior, assumes primary importance. Brain size and organization, and characteristics of neural functioning of course set definite limitations on the possibilities for behavioral development. It seems probable, however, that among the infrahuman primates motivating conditions have not been such, either in racial history or in ontogeny, to bring these potentialities to their full expression. In captivity a high premium can be placed on the exploitation of intellectual capacity, but in any given instance this has been done only sporadically and never consistently and intensively over the critical years of early individual development. It is generally assumed that man's relatively long period of physical and mental growth from birth to maturity contributes importantly to his ultimate capacities. In the apes this period is almost as long and thus affords comparable opportunity for education and training.

If, in the above comparisons, we had chosen our representative of man from primitive societies rather than from modern Western civilization, the difference between human and infrahuman behavior would be appreciably lessened. Indeed, it might be questioned whether there is a greater behavioral advance from anthropoid ape to primitive man than from the latter to an Aristotle or Newton. If all the systematic and fortuitous extra-organic factors which, through the years and epochs, have

helped to bring about man's highest achievements were brought to bear on the monkeys and apes, the comparative picture might well be changed materially.

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The following titles are more or less inclusive treatments and list detailed references to most of the technical papers on which the above account is based:

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PRIMITIVE MENTALITY.—By title the subject matter of this article belongs in a field in which various groups of investigators are interested. Biologists and social anthropologists are concerned with the qualification "primitive," while the matter of differences in mentality would normally be enquired into by racial or social psychologists.

There is probably general agreement between physical anthropologists that mankind may be divided into groupings, the members of which resemble each other physically to such a degree that these divisions may be called "races." Hrdlicka (17), for example, states: "Human raciation of the present is one of the plainest and most generalized evidences of continuing human evolution." In another publication (18) this same authority points out that this raciation "is a universal biological manifestation . . . encountered in all animal species that have a wider distribution and larger numbers, and doubtless in all plants." He lists plasticity and variability of living organisms, environmental conditions, heredity, natural selection, hybridization, segregation, and possibly mutations as factors in the process.

Biologists give similar racial definitions. Jennings (19), for example, defines a race as "a set of individuals having many genes in common—in spite of many differences in genes among the component individuals—and differing in these common genes from other sets of individuals, other races." Jennings also points out the resemblance between the dog, in its differentiation into strains, or breeds, and man in his racial development. Both biologists and physical anthropologists agree that individuals within the racial division do not show all the distinctive features equally. There is considerable overlapping and this fact may help to account for disagreement as to the number of races that anthropologists distinguish.

In determining which characters are to be considered the marks of primitive physical development, we must take a brief backward glance into the story of the evolution of the brain. A most important index of primitiveness, both animal and human seems to be the development of the frontal lobes and particularly their prefrontal areas. The demonstration of progress from the simple reptilian brain, with nine-tenths of its substance devoted to smell, up to the cerebral equipment of modern man forms a fascinating chapter in comparative anatomy. From the highly developed smell brain of a long snouted primitive marsupial, such as *Dasyiscus*, to its diminishing importance in the tree climbing marsupial, the Koala (*Phascogale*), and thence to its rudimentary appearance in the Red Monkey (*Cercopithecus*) and its almost complete lack of representation in

man, the smell brain falls as the frontal pallium rises in importance.¹

The story of protohuman and prehistoric frontal lobe development is continuous with that of the rest of the mammals. In the skull cap of *Pithecanthropus erectus*, unearthed by Dubois in Java in 1891, very little space is reserved for these important areas, the whole brain capacity being less than 1000 c.c. The fragmentary brain case of the Piltdown man (*Eoanthropus*) is according to Elliott Smith (35) markedly flattened in the frontal regions. The skull vault of *Sinanthropus*, or Peking man, discovered and described by Davidson Black (4), though a little higher and narrower than that of *Pithecanthropus* is similarly poorly developed in the frontal regions. Rhodesian man, described by Dart in South Africa, shows some progress in the height of the cranial vault, but is still very primitive. Coming nearer to modern times, Elliott Smith describes Neanderthal man as "an uncouth creature, with an enormous flattened head, very prominent eyebrow ridges, and a coarse face," to which he adds: "The large brain is singularly defective in the frontal region."

With regard to the aboriginal Australian, his skull is also distinguished by prominent supra-orbital ridges and low height in the frontal regions. His brain capacity is small, 1328 c.c. as determined by Porteus (31), 1347 by Burston. This figure may be compared with 1000 c.c. for Peking man and 1483 for the white Australian as determined by Berry and Porteus (3). With these and other comparisons in mind, Elliott Smith has no hesitation in stating: "The aboriginal Australian is the most primitive of existing peoples. He is to be regarded as the survivor of one of the lowest forms of the species *Homo sapiens*."

As to the Australian's racial classification, all anthropologists seem to agree in considering him as unique, differing from all other existing races of mankind. In skin color he resembles the Negroes; in stature, blood grouping, hair texture, hair distribution and cranial index, the Anglo-Saxon group, so that Hrdlicka declares that the aborigines' basic relations are with the white race. He regards them as "a derivative of the late glacial man of Western Asia, a remnant of an ancient stock." Boas (6) seems to be in agreement, for we find him stating: "The

¹ See Wood, Jones and Porteus (20).

Australians . . . exhibit a number of rather primitive features that set them off sharply from other races, and make us incline to the belief that they represent a type, differentiated at an early period, that may have been crowded back by the more successful races into remote corners of the world."

Thus, both because of his position among his contemporaries and his affinities with ancient races, there seems to be every justification for selecting the Australian as typical of primitive man, and centering much of our discussion about his mentality. An additional reason for so doing is the fact that there have been comparatively few studies of primitive folk elsewhere, only the more recent of which will be cited.

It should perhaps be emphasized, however, that though anthropologists may agree in placing the Australians near the bottom of the human evolutionary ladder, the aborigines do not exhibit in themselves all the physical characters that have been labelled "primitive." Indeed, the distribution of these characters is rather remarkable. Prominent brow ridges, for example, are typical of the Neanderthals, Rhodesian and Peking man, and the modern Australian, but they seem to be missing from among the Cromagnons and present-day Negroes. Moreover, they are by no means uncommon among whites. In skin color the Bushmen and the Australian aborigines, both primitive peoples, are very far apart, the former being brownish-yellow, the latter black. The Hottentots and Bushmen are also entirely dissimilar from the Australians in hair characteristics, their fuzzy peppercorns being quite the opposite to the wavy, profuse hairiness of the aborigines. None of these characteristics, therefore, can be regarded as unfailingly distinctive of primitiveness. All this amounts to the conclusion that the human family is extremely mixed and that even Nature seems to have had considerable difficulty in keeping the races straight. Admitting this confusion, there still is no justification for denying the reality and significance of racial differences.

Even brain capacity is not an infallible guide, though on the whole it is one of the most reliable indications. The Vedda of Ceylon (supposedly related to the Australians), according to Seligman (34) quoting the Sarasins, have

a capacity of 1278 c.c., while Boule (7) gives that of Andamanese Islanders as 1300 c.c. or 100 c.c. less than the average of four Neanderthals. On the other hand the brain capacity of Esquimaux is cited by Klineberg (22) as 1563 c.c. which is relatively large. However, Welcker, whom Klineberg is quoting, gives an entirely different figure, 1452 c.c., for Greenland Esquimaux, but as the number of skulls on which these averages are based is not given, the figures have little significance.

The question of the relationship between brain capacity and intelligence is by no means settled. Certainly the oft-quoted investigation on the subject by Karl Pearson (29) is not conclusive, since it has a very indirect bearing on the problem. He correlated two single measurements, length and breadth of the head, with an unstandardized mental measure, reducing results to a twelve year equivalent, and found two small positive correlations. Neither brain capacity nor intelligence can be judged on such inadequate data. Nor does anyone know how important from the standpoint of adaptability a small correlation between intelligence and brain capacity or any other correlated physical character may be, if constant over a number of generations. If one racial group had a slight but constant superiority in, say, strength of grip over another group, and this were correlated to any degree with intelligence the cumulative effect may be great in terms of motor efficiency and achievement. The differences in brain capacity between two racial groups may be equally significant.

One conclusion seems acceptable with regard to this matter. Taking the whole range of animal phyla, there would seem to be a correspondence between complexity of behavior and size and complexity of the brain. The details of the correspondence have not yet been worked out. The sciences of neurology and psychology are as yet in their infancy so that no one knows adequately the physical and physiological correlates of intelligence. The best neuroanatomist cannot take the brains of two individuals who had, respectively, I.Q.'s of 85 and 135, and point out the structural differences that would account for the admittedly great differences between the two in terms of social adaptability or learning capacity. The results of brain surgery² may

² See article on Prefrontal Lobotomy.

throw some much needed light on the problems of brain organization in relation to personality and intelligence.

As regards the physical characteristics of primitive people we are justified in making another observation which seems very significant. This is to the effect that the racial groups which differ most in physical characteristics from the whites are furthest removed from them in cultural advancement. If the two conditions have no causal connection, then it would be a most remarkable coincidence that Andamanese, Bushmen, Hottentots, Papuan, African and Asiatic negritos, Senoi, and Australian aboriginals, who are considered physically primitive, should be culturally most retarded.

This does not necessarily mean that the white's present position of dominance is assured, nor that it is to be interpreted as meaning all-round superiority of the white race. Boas lists such factors as superiority of inventions, extent of scientific knowledge, complexity of social institutions, efforts to promote the welfare of all members of the social body as marks of advancement. It may well be that the last named is of paramount importance. Humanitarianism is by no means a feature of civilized behavior today, and scientific inventions seem at present to be applied largely in the business of killing people at an unprecedented rate. Thus the supremacy of the whites may be temporary. Internecine warfare, race suicide, multiplication of neuropathic strains, devotion to the gadgets of ease or luxury may be definite threats to the present advanced status of the white race.

With regard to the Australians, there seems to be a suspicious unanimity of opinion regarding their alleged situation at the very nadir of human development. They are very generally termed "the lowest of mankind." Nadel (26), for example, pronounces the Central Australians "culturally the most primitive and backward race on earth." This suggests that a really complex matter—the determination of comparative backwardness—is being disposed of in a too facile manner.

Material culture, for example, is not a sufficient criterion of racial status unless environmental handicaps are fully allowed for. People stranded on a geologically recent volcanic isle

will find no metals available for tool making, whereas obsidian and other volcanic rocks are well suited for the making of implements. Therefore such people will remain in the Stone Age. What is made with the tools is more important than the type of tools used. Similarly, the absence of permanent houses is not a proper criterion of culture. A people condemned by sparsity of food to constant foraging would be foolish to try and set up permanent habitations. In the Kalahari, for example, the free-ranging, hunting Bushmen are much better off than the sedentary Bakalaghadi, who are anchored to one spot through their habits of primitive agriculture.

Following up this discussion of who and what are primitive, we may now turn to a consideration of the various facets of mentality or intelligence which primitive people display. Mentality is by derivation the wider term, intelligence being more concerned with the cognitive aspects of mental life, but for the purposes of this article the two terms will be considered synonymous.

For a comprehensive definition of intelligence we may turn to Stoddard (37), who finds it to be the ability to undertake activities characterized by difficulty, complexity, abstractness, economy in speed and effort, adaptiveness to a goal, social values, and emergence of originals. It also includes the maintenance of such activities under conditions that demand concentration of energy and resistance to emotional forces.

Thorndike (38) seems to base his definition of intelligence on what intelligent people do; so he lists abstract, mechanical and social intelligence, energy, persistence, self-control, leadership, various professional skills, and individual adjustment to reality "without evasions or regressions to childish and perverse solutions."

It is obvious that native Australians' mentality falls short most of all in abstract intelligence. With no words in their languages beyond three or four, arithmetical ability is sorely limited. Though they possess general classificatory terms such as "fish" or "tree," these are not plentiful. Love,³ who has studied the language of the Worora tribe, states, for example, that the aboriginal translation of "I am deeply concerned" would be "My belly is boiling." Ob-

³ From a private communication to the writer.

viciously, under such conditions abstract expression is very restricted.

Originality is also not likely to be very marked, the cultural trend being against its appearance. Departures from the conventional way of thinking and acting are socially disapproved. Especially is this the case with primitive peoples, where, as in Australia, government by the elders is the rule.⁴

As regards mechanical intelligence, there is little displayed except in the operation of pressure-flaking quartzite spear points and in the fashioning of wooden spears, boomerangs and clubs. Only in social intelligence does the Australian show to advantage. Before describing his development in this respect, however, a more suitable and comprehensive definition of mentality might be sought, one particularly that will apply to both animal and human capacity, to the primitive as well as civilized men. The application of all the specific requirements under both Stoddard's and Thorndike's definitions would place the Australian in the category of the hopelessly backward and would make his survival almost incomprehensible.

The writer (20, 32) has proposed a definition with a biological basis and has suggested that intelligence is the capacity to respond to an increasing range and complexity of relevant stimuli. A relevant stimulus is further defined as one to which it is biologically advantageous for the organism to respond. Animals may have exactly the same environment, but the more intelligent will find many more relevant stimuli to which they can respond than the less intelligent. On the other hand, certain environments limit the responses of their inhabitants.

For example, leisure to exploit the environmental opportunities,⁵ to extend the range of relevancy is a necessity for progress, but this is denied the Australian. Travel is so restricted by geographical and other conditions that the native is anchored to a limited area. Waterways, except in one corner of the continent, are so few that canoes or boats cannot be used as a

means of travel and transportation. There are relatively few offshore islands so that only in the tropical regions are dugouts or catamarans in use.

Then, too, there is no animal except the kangaroo large enough to serve as a beast of burden, and the kangaroo's saltatory gait makes it useless for such a purpose. Furthermore, as most of the animals are marsupials, milk glands are little developed, and so the native is handicapped in comparison with racial groups that have been able to domesticate the mare, the camel, the goat, sheep, or other milch animals. Finally, as a crowning disability, Australia does not produce barley, millet, wheat, oats, Indian corn, or other grain so that only tiny grass and nardoo seeds are available for grinding into flour. Only those who have watched the harvesting, winnowing and milling of these seeds by native women can appreciate the labor involved to produce a small cake. Add to this ordinary sparsity the effects of droughts prolonged as much as six years and you will realize how repressive the Australian environment is, and how deficient it is in so many things that mankind elsewhere has found relevant to both survival and progress.

In one respect the cultural set has militated against advancement. The Australian has a deep-rooted distrust and dislike of strangers. Thus though the Malays have visited the northwest coast of the continent for hundreds of years and though a narrow strait is all that separates Australia from the Papuans to the north, there have been singularly few cultural importations, the pattern of social life and material culture presenting similar features throughout the continent. Except along a coastal fringe there seems to be little evidence of any substantial mixture of blood. Thus the attitude of the Australians has accentuated their isolation.

One fact has been repeatedly cited as proof of the natives' illogicality and crass stupidity. This is their denial, even in the face of such evidence as the appearance of half-castes, of physiological paternity. They are said to explain the light color of the half-white child by saying that perhaps the woman had been eating too much white man's flour. Even anthropologists have been impressed by this persistent denial of the results of ordinary observation, notwithstanding the fact that all the implications of

⁴ There are no chiefs in Australian tribes, but leadership is vested in a headman, who does not exercise authority arbitrarily but only in consultation with the tribal council, usually composed of the older men.

⁵ In civilized society the genius in abstract thinking may be set free from food seeking to pursue his abstractions. In Australian society an Einstein while occupied with his theory of relativity would starve.

fatherhood are present in aboriginal tribal customs. Ceremonial or cult totems, through which the individual shares in the psychic life, the traditions, secret ceremonies, etc., of the tribe, are matters of patrilineal descent. Filial relationships also are freely recognized, any man will point out his "properly father" as distinguished from those to whom he applies the classificatory term which means "father."

The reason for this strenuous negation of observed facts was first suggested by Lang (23) and adopted by the writer (31). The former pointed out that southeastern tribes not only recognized paternity but ascribed to the male parent the most essential part in reproduction. The mother was merely the receptacle for the unborn child. Discussing Arunta beliefs, as set forth by Spencer and Gillen (21), Lang asks whether their nescience of obvious facts is not the result of the aborigines' faith in reincarnation. They believe that the spirits of the unborn are collected at various centers, such as prominent rocks, caves and waterholes, where they await the opportunity to enter the bodies of women. Among the Arunta, which particular center or *Knanimja* is the place of origin, is revealed to the fathers in dreams. This belief is the nucleus of aboriginal religion. The native believes in both bodily and spiritual conception, and when questioned on this point is more concerned with his statement of what he believes to be the more important fact. The white investigator is therefore misled, in the same way as an enquirer, ignorant of Christian belief, would be puzzled by many civilized individuals' insistence that God was their father.

Other observers, such as Basedow and Roheim, agree that the old men at least know the facts of generation, though the tribal elders are anxious that the young men remain orthodox in their beliefs. As a matter of fact, the native knows very well the essential part played by intercourse in relation to generation. Not only does he know in most cases the paternity of half-caste children, but he is aware of cross-breeding in animals. Dingo pups with some greyhound blood are highly prized for their combination of the speed of the white man's dog with the hunting skill of the dingo. The aboriginal's doctrine of pre-existence does not, as Elkin (10) suggests, prevent him from recognizing the facts, but merely from admitting them.

Recently Warner (39) has brought forward convincing evidence on this point. During his first eight or nine months' stay with the Muring, a group of tribes in North East Arnhem Land, he could "find no indication whatsoever of knowledge of physiological conception." Yet reviewing the total situation and the many practical implications of paternity, he was convinced that the natives must understand the mechanics of conception. On a second visit to the area when he continued his former discussions of the topic, he asked a question regarding the function of semen. He was met with expressions of contempt for his foolishness in making such a naïve enquiry when everyone knew that that was what made babies. Warner also suggests that this fact was not considered important in comparison with the natives' philosophic concepts. Thus faulty observation and interpretation of native statements is the basis of Frazer's oft-quoted animadversion (14) on the Australians: "A people so ignorant of the most elementary of natural processes may well rank at the very bottom of the savage scale."

There is another view current among many anthropologists which, if uncritically accepted, would also indicate that the mentality of the aborigines is of a low order. As is well known, the system of Australian kinship terms, embracing every member of a tribal horde, is most complex, for it not only fixes the relationship but prescribes the social observances proper to each. The writer was one of a group of whites to whom were assigned exogamous subsections and totems by our Arunta hosts. Immediately this determined my relationship to every one in the local group. There are eight of these subsections, and as a Pungata man I was the potential husband of all the Mbichana women, brother to the men and women of my own subsection, son-in-law to all the Knuria men and women, father to the Ngala, and stood in various degrees of relationship to all the rest. I could have no direct communication with any of my prospective mothers-in-law, should not speak to my younger sisters, and even in camp was supposed to sit facing a certain direction when talking to various men of the tribe. Needless to say, I found the rules too complex, disregarded them all, and was put down in aboriginal opinion as a most untutored and irresponsible person, whose ignorance was so

appalling that it was best treated as a joke. Only when I had food or cigarettes to distribute were the rights of my new relatives the subject of rather gentle reminders.

"The value of these subsections and in lesser degree of the sections and moieties," according to Elkin (11), "is to summarize kinship terms with their associated privileges, avoidances and duties, and to simplify the adjustment of these matters between tribes which differ in language and in details of their social organization." Elsewhere, Elkin states that the kinship system codifies mutual behavior, and "is the anatomy and physiology of aboriginal society."⁶ This simile would be entirely satisfactory and very illuminating if it were modified somewhat. Kinship is the anatomy, and social behavior the physiology of native society. In other words, the relationship system represents the structure, social observances the function.

It would, of course, be unwise to place undue emphasis on structure. We find Elkin stating that "the purpose of the subsection system and also of the section system seems to be concerned more with the descent of groups through the mother than with the control of marriage."⁷ If this were so, then it would seem that the establishment of this elaborate kinship system was not to codify behavior, but as an end in itself. Certainly the regulation of sex is far more important than the application of a kinship system that extends far beyond close biological ties. Everywhere distribution of food and regulation of sex are essential to the preservation of society, and under Australian conditions of sparsity both are of primary importance. If the kinship system were an end in itself, then its devising would merely make life more complicated and troublesome, which would constitute no evidence of high social intelligence but its reverse. Field workers, such as Kaberry (21), have emphasized the interest of native women in matters of sex, while Warner and others have noted that sex and food are the chief preoccupations of men. The proper regulation of such matters is vital. It is only in small communities, such as the Australian, that everybody can be brought within the compass of kinship. Hence, the aborigines seized on the kinship system as the basis of social regulation, which was a very intelligent procedure.

As Elkin rightly observes, the system was made for man, and not man for the system. This is proved by the way in which the regulations are modified to avoid individual hardship, as, for example, where no "straight" marriage is possible for a man. It is also adjusted to fit special circumstances such as the entertainment of a stranger in the camp. A reasonable statement of the situation would be that the Australians found it necessary to establish a set of social regulations and observances applying to sex, tribal authority, rituals of intercourse, inheritance of ceremonies, food distribution, etc., and found the kinship terms a most convenient system whereby these things could be done. Kinship thus superseded kingship as found in other societies, custom and ritual taking the place of personal authority.

To put the preservation of the ties of human relationship above the regulation of behavior would be to place the psychological cart before the horse. As a matter of fact, the aborigines in some respects care less about the obligations of kinship as such than we do. For example, infanticide is quite common and is not specially condemned, if the care of the unwanted infant interferes with the welfare of an older child, as it may well do under nomadic conditions. On the other hand, observances related to sex are very strictly upheld. Mother-in-law avoidance, which comes about as a consequence of a sex relationship, is the strongest social taboo, and adultery is a very serious offense.

Generally speaking, the Australians present an excellently integrated social structure which is strengthened at many points by expedients that make for social cohesion. The subsections, or sections, not only regulate marriage, but in so doing they diminish the dangers of competition for wives among the old men, the rulers of the tribe. Their authority and prestige are strengthened by the initiation rights and by the rules for food distribution. If the tribal elders were divided by serious competition and strife, the whole social system would be disrupted. Because of primitive man's tendency to ritualize all behavior, the sections and subsections have come to regulate much more than marriage, but that in the writer's opinion is their primary purpose.

Whereas Elkin regards the subsection system as a means of summarizing kinship terms, Warner speaks of it as "an extension of the kinship

⁶ *Loc. cit.*, p. 46.

⁷ *The Australian Aborigines*, p. 96.

system," and points out that each section among the Murngin has two subsections into which an individual may marry. Thus, while there are eight named subsections, this tribe is of the four-section type in regard to marriage. This does not, however, prove that marriage is not regulated by the system of sections in the Murngin and by subsections in other eight division tribes.

Confusion of thought would be avoided if the whole structure of named divisions of tribes were regarded as a method, founded on kinship terms, of codifying sex relations, and one which is in some tribes in process of development. Among the Aluridja (Luritcha), for example, there were no named divisions, marriage being regulated solely on the basis of kinship terms. The writer, however, found evidence that Luritcha in contact with the Arunta were beginning to adopt the latter's eight subsection system. Other tribes, especially in the South-east, were divided into two halves or moieties. Moiety names, such as Eaglehawk and Crow, would, of course, have little value in summarizing kinship terms. In still other tribes, notably on the Northwest coast, the Karia type of four named sections regulated marriage. In Central Australia and the southern Kimberley area, the eight subsection system prevailed. Tribes such as the Murngin are apparently in a transition stage, their subsection system simplifying or summarizing the kinship terms, but as yet not controlling marriage, which remains one of the functions of the sections.

Thus it would seem plausible to regard the Australian system as a developing process in which subsections originally evolved from sections, sections from moieties, and moieties out of ungrouped kinship terms. In short, they are kinship groupings applied *principally* for the regulation of sex relations. Regarded in this way, the system is proof of Australian social intelligence since it exemplifies progressive adaptability, and the ability to respond to a complex situation. On the other hand, adherence to a kinship system, involving every member of a tribe of, say, two hundred persons, as an end in itself would be tantamount to saddling themselves with a cumbersome method of making social behavior needlessly complicated. This in itself would be no evidence of mentality, but merely of the tendency of primitive man to ritualize behavior. If this behavior

could be codified, then that would mean a long step in advance towards a more ordered existence, making for tribal cohesion. Since this has been done, it is, in the writer's opinion, proof of aboriginal planning, and therefore of intelligence.

Mention should be made of another animal-version on aboriginal mentality. This is to the effect that the native is extremely unforseeing and improvident since he makes no attempt to store surplus food. This improvidence is more apparent than real. Blow flies are so prevalent that meat cannot be subjected to any sun-drying process, while plant supplies are so scanty that it pays the natives to move off to new hunting or collecting grounds rather than to set up granaries for a pitiful surplus, if present. In extended droughts permanent water rather than food supplies determines the nomadic range.

On the other hand, the natives take the best means they know to conserve food supplies, means that in their opinion are much more effective than storage. When there is any time to spare, the men of the horde, under the careful direction of the old men, devote themselves to the carrying out of "increase ceremonies," whose object is to ensure not only the continuance of animals and plants used for food, but the whole balance of Nature. The Australian aboriginal lives by faith much more nearly than the modern Christian. This devotion to his religious beliefs cannot be advanced as proof of primitive man's inferior mentality, except perhaps under the heading of what Thorndike calls persistence "in perverse solutions." We also occasionally pray for rain.

Brief reference should also be made to the well-known theories of Levy Bruhl and Durkheim, which assume fundamental differences between primitive thinking and that of civilized man. This thinking, they believed, is pre-logical in that primitive people are swayed, not by individual conclusions, but by collective representations, products of the group mind. Further, the primitive mind is supposed to be unable to separate the mystical from the real, so that logical evidence has no appeal. It is more reasonable to conclude that primitive man's thinking is pre-scientific rather than pre-logical, much as is a great deal of the thinking of people in our own society. Boas rightly emphasizes the influence on thinking of the body of traditional knowledge, in the light of which a given experi-

ence is interpreted. Reasoning, he says, "becomes more and more logical, not because each individual carries out his thought in a more logical manner, but because the traditional material which is handed down to each individual has been thought out and worked out more thoroughly and more carefully."⁸ In short, primitive man accepts more that is unproved, needs less support for his conclusions, and possibly becomes more emotionally involved as regards his beliefs. He is illogical and pre-scientific, rather than pre-logical or completely unscientific.

So far we have dealt mainly with the primitive Australian's reactions to his natural environment and the statements that have been made which seem to reflect too harshly on the narrowness of the range of relevant stimuli to which he responds in that environment. We may accept the fact that he displays abilities such as persistence, energy, self-control, social intelligence, leadership, and special skills involved in his almost miraculous feats of tracking animals and men. Economy of effort, adaptiveness, and concentration are also called for if he is to cope with that environment, but these all have limited application.

As the result of white settlement of a considerable part of the continent, the aboriginal has been confronted in the last hundred years or so with opportunities to increase the range and complexity of his responses to relevant stimuli. If we are to get a measure of his progressive adaptability we must enquire as to how he has availed himself of his changed environment. For those tribes in contact with whites the conditions of existence have been essentially changed. The transition from the stone to the machine age has been most abrupt, perhaps so abrupt that native life will be extinguished in the process.

This process of extinction has unfortunately taken place over large areas of the continent, especially in the fertile southeast. Elsewhere, it is going on rapidly. The building of the East-West railway line, for example, has resulted in complete or partial tribal disintegration throughout a strip of country several hundred miles wide beside the tracks. Handouts of food and cast off clothing have induced the natives to forgoth at several localities, notably near Ooldea, where there are supplies of permanent

water. The railway line to Alice Springs, 1,000 miles to the north from Adelaide, and the construction of the military highway to Port Darwin have changed the face of the country and the lives of the natives. Trains, airplanes, automobiles have now become a common part of the outback scene. Can they become relevant in aboriginal environment?

The fact that native survival is dependent not only on food but on their participation in the psychic life of the tribe has been underscored by Elkin (12). He states that "the aborigines had reached a stage of satisfactory adaptation to their environment—economic, social, and religious. But the coming of the white man meant a radical change in the environment—radical because spiritual, though it also meant, and means for most natives, a new economic orientation, and soon, though not necessarily, a change in the social ordering of life." Through the decay of tribal life, the non-transmission of myths and ceremonies, the breakdown of social sanctions, the native becomes attracted to the white settlements where he loses his virtues and becomes a degraded hanger-on to the skirts of civilization.

Elkin believes that education for the new life is the only solution. He would include the teaching of reading, writing and arithmetic and simple industrial techniques to fit the aboriginal to take his place in the new order. The question then arises as to the native's mental ability to assimilate such instruction.

A very sanguine estimate of this ability has been founded on a very dubious statement that crops up from time to time in the literature. In 1881, Dawson (8) reported that an aboriginal school at Ramahyuck in Victoria had achieved a most remarkable record. He stated that the percentage of marks gained in examinations by government inspectors was 100, "a result unparalleled by any other school in the colony." Mathew (25) in 1899 repeated this statement and it was again quoted by Lefroy (24), and more recently by Ashley-Montagu (2).

The facts throw a different light on this report. Schools in those days were compared on the basis of promotions attained by pupils, not examination marks, and a diligent search of the records shows no higher percentage of promotions for Ramahyuck school than 94. Furthermore, each inspector set his own examination and no doubt tempered its difficulty to

⁸ *Loc. cit.*, p. 223.

aboriginal mentality. No mention either is made of the age of the children promoted. On the face of it, the record, being so much at variance with all subsequent experience, is incomprehensible except on the grounds of acceptance of extremely low standards of achievement for the aboriginal pupils. Mathew, indeed, qualifies his praise by saying: "While among Europeans the range of mental development seems almost unbounded, with the blacks its limit is soon attained. An inherent aversion to application is generally an impassable barrier to the progress of an aboriginal's education."

We find, too, a very pessimistic note appearing in Elkin's recent summary (12) of the results of those educational efforts on behalf of the aborigines which he so earnestly recommends. After analyzing the opinions of forty teachers of aboriginal children throughout the country, he says: "So far, they (the aborigines) have not shown themselves capable of adapting themselves to the new, nor have our attempts to help them been successful." He raises the inevitable question as to whether their former adaptation had not become "biological," and so specialized that the outlook for educational and social adjustment for full-blooded natives might not be hopeless. As regards education, the gist of the matter is the ability of the native to include the basic symbols of abstract thought within the range of his relevant stimuli.

It must be admitted that schooling as offered to the native is not of a very high order. Elkin mentions lack of trained teachers, obsolete methods, late age of school entrance, pidgin English, and retarding influence of home or camp life as special handicaps. Keeping these things in mind and giving most weight to the evidence of trained teachers, he summarizes their opinions on native abilities as follows:⁹

- (1) Full blood children seldom pass beyond the third standard, occasionally reach the fourth, and very rarely go higher.
- (2) More years are spent reaching these standards than are taken by white children attending the same schools.
- (3) Except in rote learning, writing and manual subjects, aboriginal children are markedly inferior. "Parrot learning is the rule." "Not one of my informants," says Elkin, "even suggests that the aboriginal

pupils are the equal of white children in school, even before puberty, and this they maintain is true of half-castes."

- (4) Departmental intelligence tests applied to sixty children of mixed blood revealed three years' retardation, whereas white children attending the same schools proved normal.
- (5) Full blood and half-caste children, though equal to white children in mechanical work, soon reach their limit in educational development. There is practical unanimity of opinion that progress does not continue after puberty.¹⁰

Though Professor Elkin doubts the ability of the psychologist "to put his tests across," the picture which they present of primitive mentality is in one direction at least more promising. Tests of practical intelligence involving planning capacity, such as the Porteus Maze, present by no means unfavorable results.

These tests are certainly not, except to a very limited degree, "matters of culture and tradition and not just of individual mental capacity" as some cultural anthropologists believe. It would be difficult to prove that running a course through a graduated series of printed mazes is part of a white child's tradition and culture. With the aboriginal's almost photographic memory for terrain, and his constant necessity to orientate himself correctly in the bush, the maze test presents a problem to which his mental set is by no means averse. This is proved by the concern and anxiety to succeed which he exhibits in the test. This is testified to by investigators such as Fry and Pulleine (15), who worked with Australian natives, Kilton Stewart, who applied the Maze test to Ainu, Philippine Negritos, Formosans, Senoi of Malaya, and Bajou of Borneo, and the writer (33), who examined African Bushmen and noted their extraordinary interest in the test. Fry and Pulleine remark, "While watching a

¹⁰ No mention has been made of aboriginal art. Compared with Bushman cave paintings this is by no means highly developed. Nevertheless, there is probably much latent ability. Albert Namatjira, a full-blooded Arunta, after some instruction by Rex Batterbee, an Australian artist, for whom he acted as camel boy, has shown extraordinary talent in water colors, his paintings having been exhibited and reproduced in a recent book entitled *The Art of Albert Namatjira*, by C. P. Mountford, Melbourne, 1944.

⁹ *Loc. cit.*, pp. 488 ff.

native at work on these problems one can almost feel the intensity of the mental strain involved." Dubois (9), working with the people of Alor, found that as soon as the tests began to be difficult, her subjects perspired freely and their body odor increased. To any writer familiar with the casual and perfunctory approach of primitive subjects to a test in which they are not really interested, this evidence of anxiety to succeed disposes fully of the suggestion that the maze test has not been successfully "put across."

The results of these maze applications offers no support to the view that the Australians represent the lowest of mankind. The score of one group, mainly of Arunta, who had been in contact with the Lutheran mission in Hermannsburg, averaged 12.08 years (0-2.087). Several Luritja, who had come in from the desert and up to a few days previously had never seen a white man, were included, and one of these made a perfect score.

Piddington (30) also examined 24 adult males at La Grange in Western Australia and found their average to be 10.52 years, which was almost exactly the score obtained by the writer with 65 adult males in the Kimberley district about 300 miles to the east. Fry and Pulleine's group of Iliaura natives averaged 10.7 years, which may be accepted as the maze performance of aborigines who have had no contact with missions.

This score may be compared with that of other primitive groups elsewhere. "Raw" natives belonging to three African tribes, Mchopi, Shangaans and Amaxosa, were examined by the writer (33). The last named tribe, who are Zulus and familiar with a labyrinth game played by means of a design drawn in the dust, scored 10.78 years (0-2.76), while Shangaans averaged only 9.3 years (0-2.66), and the Mchopi 8.34 (0-2.45). Thus though these Bantu tribes are culturally placed much higher than the Australians, they did not, with the exception of the Amaxosa, score nearly as well as the aborigines.

Natives of three other tribes, Bathonga, Wakaranga and Vandau, all of whom were being educated at mission schools, may be compared with the Central Australians at Hermannsburg mission. The average performance was about a half year in test age below the aborigines. Here again the advantage lay with

the supposed cultural inferiors. Bushmen of the Kalahari could only average 7.56 years (0-2.17) in spite of their intense interest in the test.

Kilton Stewart, under the writer's direction, applied the tests to various primitive peoples in East Asia; Bajous or sea gypsies of Borneo scored 10.61 years and Senoi or Sakai of the mountains of Malaya 10.43 years, but Negritos of Luzon averaged only 8.88 years, while the coastal Sakai Jeram, a very backward tribe on Malaya, scored 8.02 years, not much above the Bushmen.

Anthropologists have questioned the significance of maze test results. At least 85 per cent of defectives, irrespective of race, make extremely poor scores in this test so that it has widespread use as a diagnostic measure. It can be applied independently of language, and adults who have never before handled pencil and paper seem to be able to master the technique of drawing between the lines notwithstanding, as one investigator remarked, their astonishment at seeing the "trail" or spoor follow the pencil. Recently new light has been thrown on the question of maze score significance, through the effects of the brain operation of prefrontal lobotomy.¹¹ These show that when the organization of the brain in the frontal lobes has been impaired by severing the sub-cortical connections with the thalamus, there is a marked decline in maze test performance. In the feeble-minded this organization has never been fully developed.

Another study by O'Shea and others (28) indicates that artificially induced Vitamin B deficiency will also be reflected in poor maze scores and that improvement in test response proceeds proportionately as the deficiency is made up by feeding with B complex.

The observed practical intelligence and social planning of the Australians correlates well with their Maze test performance. Unfortunately, their poor educable capacity is indicated by extremely low scores in other tests (31). In an auditory rote memory test for digits, the memory span of adult males was found to be less than four digits, a white four year level. All the subjects were familiar with the names of the numbers up to ten. Mission Bathonga, on the other hand, scored an average of 5.34 digits, a performance fully 4 years in test age above the Australians. Clinical observations show that

¹¹ See article under this heading.

individuals with marked deficiency in rote memory have great difficulties in mastering the rudiments of either reading, spelling or arithmetic, commonly all three. That has been the experience at the Psychological Clinic of the University of Hawaii, where several thousands of educationally retarded Filipino, Japanese, Chinese, and part-Hawaiian children have been tested.

Visual memory was also determined by a xylophone arrangement of the Knox Cube Test, in which four bars were struck in series to be reproduced by the subjects. No doubt because of this visual presentation the Australians scored much better in this test, averaging 8.33 years in test age. But they were excelled by all the Bantu tribes except the Bathonga, the Vandau being a full year superior to the Arunta.

In Goddard Form Board times, the Australians and Bushmen had the slowest times, the South African natives excelling the other primitive groups. In a test of matching photographs of footprints, the performance of all the native groups was more nearly equalized.

In regard to other examinations of primitive mentality, if we reject from the list those of the Binet type which depend on language to such a degree as to be obviously unsuited for their purpose, we are left with singularly few of any importance, and even those employ a very narrow range of tests. In 1904, Woodworth (40) applied a Seguin Form Board test to Igorots, Pygmies and Negritos exhibited at the St. Louis Exposition, thus establishing a pioneer record. His conclusion reads: "If the results could be taken at their face value, they would indicate differences of intelligence between races, giving such groups as the Pygmy and Negrito a low station as compared with most of mankind." This position has been occupied by these racial groups in subsequent investigations. Tests scored on speed are usually not dealt with successfully by primitive peoples, but the error score of the Pygmies and Negritos was similarly inferior.

Garth (16) reported work with various American Indian groups, but unfortunately used a group test, the National Intelligence Test, which is obviously unsuitable. The Pinter Non-Language scale was applied by Owen Smith, a student of Garth's, to full-blood Indians in schools in the Southwest of the United States, and their average I.Q. was only 71.6. However, this scale also, though not dependent

on language, was hardly suited to the cultural background of Indians. The study was reported in 1931. Blackwood (5) reports another study with Indians but used an unstandardized scale, the Squires International Test.

In 1930, Nissen, Machover, and Kinder (27) gave performance tests to 50 native children of the Sousou tribe in French Guinea, Africa. They tried out 12 performance tests, six of them taken from the Army Performance Scale which was arranged for adults and was therefore unsuited to younger children. Strangely enough, one of the tests applied was the fitting together of the parts of a picture of a ship, though the natives had never seen even a canoe, let alone a ship. These authors' conclusion that the inferiority of their subjects in test scores is "unequivocal" must, as they point out, be cautiously interpreted. They note that their cases seemed to work harder at the Maze test than at any other.

One of the most careful studies of primitive mentality was that conducted by Vicary (41) in North Bengal, his subjects being immigrant Santals and individuals of other aboriginal tribes attending a mission boarding school. These people are considered to be Dravidian or pre-Dravidian in origin and "represent tribes which have retained their primitive tribal organization almost unimpaired, though they have wandered far from their homes in the low hills of the Chota Nagpur plateau."

Out of twelve commonly used performance tests, Vicary found three to be reasonably valid and applicable. These were the Porteus Maze, the Knox Cube Imitation, and the Goddard Form Board. The Maze test correlated highest with all the other single tests and highest with the sum of these, showed the most regular growth development, proved most suitable for retesting, and was the heaviest loaded with "g" in factorial analysis. The weighting finally allotted to each of the three tests when combined in a scale was Maze 5, Goddard Form Board 2, Cube Imitation 1.

The Maze test score of 59 Indian male aboriginal subjects over 14 years was 9.52 years as compared with 104 Australian adult aborigines' average of 10.97 years. Thus the superiority of the Australian performance in the Maze was again demonstrated. But in the other two tests the situation was reversed. The Australian males averaged only 8.3 years on

the Cube Imitation Test, while the Indian aborigines averaged 9.08 years. The latter's advantage was even more marked in the Goddard Form Board in which the Indians scored 9.89 years as against an 8 year average for the Australians. These results agree with those reported by the writer with regard to six South African Bantu tribes. The Indian aborigines were, however, superior to the African Bushmen in all three tests.

Fick (13) also reports results of an extensive study of South African native school children. After using a variety of performance tests, his choice narrowed down to four. Two of them, the Porteus Maze and Cube Imitation (Knox) had been, as we have seen, already applied to primitive peoples, and the others were the Worcester Form Boards and a South African test, the Match test of Malherbe. Fick first examined over 500 children in a preliminary study and then applied the four tests, combined as a scale, to 180 twelve year old children attending urban and rural schools. Fick's conclusion was: "Around the ages of 13 and 14, native children are from 4 to 5 years inferior to European children in educability as gauged by the results of intelligence tests."¹²

Anderson and Eells (1) carried out a study in Alaska, but since they used a modified Binet their results are not particularly germane to our subject. They did, however, apply the Goodenough Test and found that the derived I.Q.'s were for Eskimo children 89.6, Indians 91.6, and Aleuts 93.3. These figures may be compared with an I.Q. of 77.4 for Central Australian full blood children, 89 for three-quarter blood aborigines.

It will be noted that in this survey of studies of primitive mentality scarcely any reference has been made to the results of group tests. Clinical psychologists for various reasons regard these as much less valid than individual tests and almost wholly unreliable for the purposes of mental diagnosis. As regards their application to primitive peoples, they are entirely impossible. Even if non-verbal in character their application depends on verbal instructions. Frequently, as was the case with Mann's study of children in Fiji, they are applied and scored by teachers, rather than by psychologists. For the purposes of this article they are considered to be of very questionable significance.

¹² Loc. cit., p. 54.

This leaves a very restricted list of investigators using individual performance tests. Out of 98 references cited by Mann in a recent survey (Psychological Bulletin, June 1940), only 13 had first-hand experience with this kind of testing of really primitive subjects. This fact diminishes seriously the significance of Klineberg's recent statement to the effect that the writer is one of the very few investigators who still believe that race differences exist. There are, in any case, very few investigators of primitive mentality, and their results show a rather remarkable agreement in proving that primitive peoples differ not only from whites but also among themselves. In regard to their status in intelligence, the situation may be summed up by saying that though they are excellently adapted for survival in their original simplified environment, they are much less equipped to deal with the rapidly changing world that surrounds and threatens to engulf them.

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PROJECTIVE TECHNIQUES. — Projective techniques refer to a group of psychological methods which are characterized by more or less free responses to more or less unstructured stimuli. For instance, a person may be shown an ink blot and asked what it resembles or what he sees in it. Psychologists have been interested in free responses to stimuli for years, but formerly this interest was concentrated on what the response might indicate concerning the ability of a person. More recently, however, it has been discovered that behavior is an expression of inner drives, impulses, feelings, fantasies, and conflicts, and by permitting the free choice of the response to be made to a stimulus one learns the direction and nature of the individual drives, preoccupations, feelings, and conflicts. Accordingly projective techniques cannot be defined merely in terms of the free responses to stimuli, but they must also be defined in terms of the interpretation of the meaning of these responses for the light that they may shed on personality. Projective techniques have piqued the curiosity of psychologists because they promise to serve as a means of investigation of some of the dynamic factors in personality.

Projective techniques may be contrasted with psychometric methods. The latter ask questions for which there is only one correct answer and the individual is challenged to produce that answer. Psychometric methods have also been employed in the study of the answers to questions where there is no one correct answer, but where the answer is an expression of the individual's interest, attitude, or adjustment. But in these questionnaires the range of answers is definitely limited. In a questionnaire one has to say whether he does or does not have frequent headaches, whether he does or does not like to sing, does or does not believe in group medicine as a wise social policy. Projective tech-

niques differ from these questionnaires by permitting greater scope in the response. A child may be asked to draw a man and may include (or not according to his wishes) two arms or two legs. And since specific questions are not asked, but a person is challenged to tell a story, draw a picture, mold clay, or interpret an ink blot, he is not aware that the choice, nature, and quality of his product or response will be interpreted to indicate his personality characteristics.

The term projective technique was first used by L. K. Frank (5) in a paper published in 1939. It represents the conflux of two widely different streams of psychological interest and method—psychometrics and psychoanalysis. For years psychometricians had been exploring the nature of the free response. As early as 1879 Galton (8) experimented with free association to words as stimuli. Cattell and Bryant (4) were also experimenting with free association in 1889. Binet with his collaborator Henri (1) studied responses to inkblots in 1895 and also tried out sentence completion experiments in the same year. G. Stanley Hall's eclectic interest in child study led him to explore a number of children's interests and one of his students—Brittain—in 1907, in a study of daydreams, explored the kinds of stories that children write to the stimulus of pictures, anticipating by many years Murray's (19) use of the same procedure as a projective technique. However, each of these investigators was interested only in the responses, which they classified and tabulated and used vaguely to estimate the mental development of a person, and they did not use them as a means of understanding the nature of a person's inner life.

Freud was the first to discover that the products of a person's free associations were related to his inner drives and conflicts. In his study of dreams Freud (7) asked his patients to associate freely to the dream and its elements, and by relating elements in a string of associations he was able to discern significant facts concerning a person's inner life and his unconscious mental processes. This method of free association became the primary tool of the psychoanalytic method by means of which unconscious processes were revealed. In the free association of the psychoanalytic method no stimuli are used—the patient is asked to let his

mind wander as it will. In using projective techniques the psychologist is abandoning perfectly free association for the free response to selected stimuli. This first step toward standardization of the free association method makes possible controlled observation, and the comparison of free responses to a standard stimulus. By controlling the situation in this way the psychologist meets part way one of the demands of scientific method—the reproducibility of the experiment—which free association could never fulfill. Projective techniques also help to systematize the response in a way not possible in the interview and systematize both the situation and response beyond that possible in free observation.

Free association to words as stimuli were first used as a projective technique by Jung early in the century (1904), although his treatise on the subject was not published in English until 1919 (13). The use of ink blots as a projective technique was experimented with by Rorschach for a decade or more before he published *Psychodiagnostik* in 1921 (23). Neither the free association method as a projective technique (it was used following Kent and Rosanoff (14), by comparing common and unusual associations) nor the Rorschach method claimed much attention or usage among psychologists until recent years. The Thematic Apperception Test (telling stories to pictures as stimuli) as developed by Morgan and Murray (19) in 1935, and Murray's book *Explorations in Personality* (20) in 1938 gave the impetus to the modern development of projective techniques.

The application of the psychoanalytic method to children has contributed greatly to the development of the projective method and projective techniques. Freud himself was the first to apply his psychoanalytic method to children in his study of a five-year-old boy with a phobia (6). This method was also studied by Von Hug Hellmuth (12), but it was Melanie Klein (15) who showed how a child's play can be interpreted to reveal important characteristics of a child's inner drives, feelings, and conflicts. Out of her work has developed the interpretation of children's play and of the products of children's imagination in painting, drawing, clay modeling, the building of models and the manipulation of materials—all to be classed as projective techniques.

MEDIA

Projective techniques have used a variety of media. It is appropriate to range these from the completely unstructured stimulus such as a lump of modeling clay to those which are highly structured such as a doll or a photograph. The crayon and the blackboard or pencil and paper is the limit of the unstructured situation inasmuch as the stimuli to be responded to have no structure whatever except the shape and size and texture of the board or paper and the crayon. Since projective techniques depend on the principle of free association or free expression, it is important that the medium used gives free scope to action and provides the widest possible latitude in choice of response or form of expression. Painting and drawing are excellent for this purpose. In securing a child's drawing for use as a projective interpretation one would give the child freedom to paint or draw whatever he wishes to. The figures of men drawn in the Goodenough Drawing Intelligence Test (9) lend themselves to projective interpretation, but its value as a projective technique is lessened by virtue of the fact that the child is given a subject to draw which to that extent circumscribes his drawing.

In like manner it has been pointed out that in using pictures for interpretation they should have a minimum of detail, leaving as much as possible of the background and definitive qualities of the people in the pictures to the imagination (27).

RESPONSES

Frank (5) has made a classification of projective techniques into four types according to response, to which a fifth is here added—the *constitutive*, *constructive*, *interpretive*, *cathartic*, and *expressive*. Those techniques in which a person is given some unstructured material and is asked to mold it into some form which has meaning for him, or in which he takes relatively unstructured material and tells what he sees in it are the *constitutive*. For this purpose such pliable substances as clay, plasticine, cold cream, dough, or snow have been used. Drawing or painting belong in this first category. Finger painting with colored starch paints upon a wet paper surface have yielded significant results. Musical composition, story writing, and the interpretation of the relatively unstructured

and meaningless ink blots in the Rorschach method may also be placed in this *constitutive* category.

In the second group one *constructs* by *organizing* separate meaningless parts into meaningful wholes. Building with blocks is a crude example. Organizing little toy figures of buildings, people, animals, and landscape features into a meaningful whole as is done in the Bühler-Lowenfeld "World Test" (3, 17) represents the same kind of response on a higher level. Children's play with toy materials comes in this category also. If one wants to think of words as the building blocks of language, story and sentence completions are two types of projective techniques which belong in this second type.

A third type of response requires *interpretation*. Pictures which may be interpreted by telling what they mean, or what the characters in the pictures are doing, saying, thinking, or feeling, serve as convenient stimuli. The interpretation need not be too intellectual and may partake more of the nature of reverie or day-dreaming, as when one tells what thoughts and feelings a musical selection or an odor arouses in him. The response to the Rorschach ink blots belongs in this category too, as the individual interprets what he sees in them.

In the fourth type the person reacts to the situation with *feeling* so that the response may have some *cathartic* value. These reactions may be overt and manipulative, as when a child does violence to a doll figure whom he takes as a surrogate of some member of his family; or verbal and symbolic as he shouts vengeance during a Punch and Judy show, or as he finds outlets for his feelings in the drawing of a comic strip. The expression of feeling may be overt and manipulative—or it may be expressed more covertly in words and speech or even by gestures and posturings.

The fifth group consists of the so-called *expressive movements*; gestures, handwriting, voice and speech, and gait; and those which have been solidified into posture, expression or profile, which may express inner feelings, tensions, inhibited impulses, and the like.

INTERPRETATION

The most important feature of a projective technique is not the *type* of stimulus provided or response given to it, but the interpretation

which is made of the response. For it is believed that a person's inner drives and conflicts will reveal themselves through a number of media and different kinds of expression. Probably time, economy, and similar practical considerations are more important criteria for the selection of stimuli for projective techniques than psychological considerations. Indeed, the best projective responses are secured with the least elaborately structured or organized equipment.

There are differences of opinion as to whether a projective technique is best interpreted by treating it psychometrically or using a more qualitative and analytic type of interpretation. Since those who first experimented with projective materials were trained in psychometrics it was only natural that early users of projective materials should have attempted a quantitative and psychometric interpretation. Even Rorschach, a psychiatrist, analyzed responses to his plates in terms of the type of response, part of the plate responded to, etc., and every person interpreting a Rorschach record first analyzes the responses and tabulates them on a score sheet. Murray in developing his Thematic Apperception Test in which interpretations to pictures are made by the person taking the test, proposed to analyze and tabulate the themes found in the stories. Attempts to score projective techniques are still being attempted, so that it is not possible to give a final answer to this issue at the present time. Murray (20) proposes that the Thematic Apperception Test be first analyzed into the force or forces in the form of *motives, trends, feelings, needs, or drives*, emanating from the hero of the stories, and the force or forces emanating from the environment which he calls a *press*. He proposes to fit the classification of the needs into a list of 28 needs which he has derived from his experience in studying needs, and then he would rate the strength of each need on a scale of zero to five. Murray suggests that the relative strength and frequency of these needs and press can be interpreted quite simply and directly as things that the subject has done or wanted to do, elementary forces in his personality arising from his forgotten past that he is experiencing in the present or that he has hopes to do or feel in the future on the one hand; and as situations he has experienced actually or in fantasy or situations that he would like to

encounter in the future on the other hand. But the exact nature of such interpretations from tabulated and rated analyses of the themes in the material is very doubtful.

It is safe to say that at the present time the interpretations of most significance are those which are purely qualitative and analytic. Murray (21, p. 7) suggests that the subject can be characterized for his "superiority (power, ability), inferiority, criminality, mental abnormality, solitariness, belongingness, leadership, and quarrelsomeness." He suggests looking for themes centering around "problems of achievement, rivalry, love, deprivation, coercion and restraint, offense and punishment, conflict of desires, exploration, war" (21, p. 13). He believes projective techniques can answer such questions as "how much force (energy, determination, enduring effort, competence) does the hero manifest? What is the strength of the facilitating or beneficial forces of the environment as compared to the opposing or harmful forces? Is the hero's path of achievement difficult or easy? In the face of opposition does he strive with renewed vigor (counteraction) or does he collapse? Does the hero make things happen or do things happen to him? To what extent does he manipulate or overcome the opposing forces and to what extent is he manipulated or overcome by them? Is he coercing or coerced? Is he mostly active or passive? Under what conditions does he succeed, when others help him or when he strives alone? Under what conditions does he fail? After committing an offense or crime does the hero get properly punished? Does he feel guilt, confess, atone, or reform? Or is the misdemeanor treated as a matter of no moral significance and the hero allowed to "get away with it" without punishment or fateful consequence? How much energy does the hero direct against himself? (21, p. 12).

Projective techniques may be divided rather sharply into two classes according to whether they lend themselves primarily to *formal* interpretations or to *content* interpretations. In general, the responses to unstructured material are best suited to formal analysis, of which the Rorschach is an example. It is commonly said that the Rorschach sheds light on the *structure* of personality. By analyzing the *location* of the *stimulus* which is responded to and the *quality* of the *response*, as well as the number of re-

sponses, the speed of response, blocking of response, and commonness or originality of response such factors of personality as tendencies toward introversion-extroversion, constriction-dilation and predilection to anxiety as well as more specific psychotic trends and signs of organic neurological disturbance can be diagnosed. The content of the response is relatively unimportant, but is not wholly disregarded in the Rorschach. But the Thematic Apperception Test reveals *content* principally and while some attention may be paid to such formal factors as "structure, style, mood, degree of realism and power of the plot and language of the stories" (21, p. 18), the stories are particularly useful in revealing content. Such products as paintings and drawings, free play with toy materials and the like yield both *formal* and *content* factors.

The term projection was undoubtedly borrowed from the Freudian mechanism of projection, but it has a far weaker (and wider) connotation than the mechanism. In a projective technique there is undoubtedly a projection as the individual projects into the product of his fantasy trends which are true of his own personality and it is on this hypothesis that the whole interpretation of projective techniques is based. For instance, in the picture-story method the impulses and trends of the characters in the stories may be projections of impulses and trends of the individual telling the story. It may also be said that the individual *identifies* himself with the characters which he *projects* into his fantasy products. While he may be unable and unwilling to admit certain trends in his own personality because to do so would be too uncomfortable and dangerous (and hence those trends remain unconscious), he is able to face them openly by projecting them into some external product of his imagination—possibly a character with whom he identifies himself in a story he has told. Murray (21, p. 6, f) refers to the hero of the story—that is, the main character of the story, the one in whom the story-teller is most interested, and from whose point of view the story is told. Murray believes that the individual telling the story identifies himself most closely with the hero. But it is also probably true that there is identification at different levels and in varying degrees with each of the characters of the story. Indeed, some minor character which plays an *insignificant* role may be the carrier of some

important disguised wish or role of the story-teller.

One issue with regard to the use of projective techniques is whether they can be used blind or not—that is, whether they can be interpreted without knowing anything else about the subject. To the experimental psychologist this would be a *sine qua non* of the validity of the projective method. Those with a scientific and experimental background believe that if a projective technique must be used only in conjunction with other facts and information about a person, it will be colored and biased by that material and hence invalidated. But clinical psychology recognizes the complexity and patterning of personality and believes that any single aspect of personality is relatively meaningless. There is a belief among clinical psychologists that it is impossible to interpret projective material validly in isolation and they insist that it should be interpreted only in conjunction with other facts about an individual. Indeed, the more that is known about an individual, the more meaningful and significant the projective material becomes, and the more light it sheds on the person who produced it. It is never possible to say positively that this item in a literary or artistic production signifies so-and-so about the person who produced it. One must always say that it *may* be a quality of the person, and the probability that one is correct in making such a statement grows as more is known about the person. Projective material merely helps to build up the composite picture of the personality of an individual.

One reason that one can never say with assurance that projective material means this or that about the person who produced it is that one never knows the *level* of personality from which it springs. It is a fascinating and plausible hypothesis that every production of a person represents *some* dynamic trend within him. If we knew enough, every shred of the stories a person produces would tell us important things about him. If all of the trends within an individual were at the surface, and had an immediate counterpart in behavior, then there would be a one-to-one correspondence between the fantasy material and personality. But some trends are repressed and unconscious. Indeed, the individual, in order to disguise them and hide them even from himself, may adopt exactly the opposite pattern of behavior in his

own personality. A mild person may tell stories of violence and destruction, these latter representing repressed impulses that are not permitted expression in his actual behavior, but only in his fantasy production. Murray recognizes several (at least three) such levels: the first or manifest level, the second or repressed level, and the third the symbolic or infantile level. One never knows at which level projective material is pitched, and the level can only be discovered by becoming more intimately acquainted with the person. It is a suggestive hypothesis that in emotionally stable and normally adjusted individuals there is strong resistance to revealing unconscious and repressed impulses so that there is little correspondence between fantasy material and actual life personality—the well-adjusted person lives realistically in the present but his fantasies are revivals of long submerged impulses and trends; but that in emotionally disturbed individuals the conflicts put pressure on the individual to reveal and relive his unconscious trends and they become acted out in behavior so that there is a close correspondence between fantasy material and personality. But this hypothesis remains for future validation.

From the foregoing one may deduce that projective techniques in their modern use cannot be thought of as tests which tell something definite and clean cut about a person. They merely suggest hypotheses which must be substantiated by referring them to actual life history or interview material. It is doubtful if projective techniques can ever be validated by statistical methods. The same item in a projective technique may be interpreted differently on two different occasions. If a given trend in projective material—say aggressiveness—may mean for one case that the individual shows aggression in his behavior while in another it means that his aggression is deeply repressed—then obviously no application of correlation methods is going to indicate the true nature of the correspondence. One boy may find brunettes fascinating because his mother was a brunette; another boy may repress this tendency to be fond of brunettes who resemble his mother and may himself be attracted to blondes as a reaction formation. Although there appears to be little statistical relation between the choice of companion and parental type, dynamically the same factors may be operating.

Macfarlane (18) proposes the following methods of validation of projective techniques: 1) correlation of items or elements in projective material with outside criteria, 2) comparison of the projective material with the life history, 3) longitudinal or parallel studies of projective material and life history material, 4) the experimental approach, 5) success in prediction from projective material to actual behavior. But each of these methods is in a sense inappropriate. The only test of the validity of projective interpretations is the dynamic correspondence of the projective response with the personality of the individual as revealed through intensive and analytic personality studies. Rosenzweig (24) fears lest the interpreter project his own fantasies into the process of interpretation. But this is inevitable—probably the best interpretations are those in which the experimenter interprets the fantasy material of another person in the light of his own fantasies and his experience in understanding the fantasies of others. The danger comes not in projecting oneself into the interpretation, but in failing to follow through with the check from the direct study of the person through interviewing and free association. Macfarlane also speaks of the danger of overgeneralizing from projective material. This is a danger inherent in all methods of clinical investigation and can be avoided by the demand for corroborative evidence and larger samples. The blind interpretation of projective material may or may not be worthwhile—the value of projective methods comes only as the interpretation is corroborated by the pattern of the personality as revealed by other data, preferably from direct interview and analytical study.

SPECIFIC TESTS

In the years in which projective techniques have been experimented with only a few instruments as such have been developed. First of all, there is the *word association* test, credit for which as a psychological method goes to Sir Francis Galton (8) and as a projective technique to Jung (13). In the word association test a subject is presented with one word after another and is asked to write down the first word which occurs to him after the stimulus word is presented. Jung's list of 100 words is a standard list. The Kent-Rosanoff list (14) has been used more as a psychometric device than as a projective technique. The word association

test yields words of real projective but somewhat limited practical significance. The burden is left to discovering the meaning of the responses from other material more than in most other projective techniques.

The *sentence completion* test, first tried out as a projective test by Tendler (30) and also by Hildreth and Rohd  (10) yields results that are a little richer in content and suggestiveness, but still require validation by comparison with other data about a person.

Probably the most widely used and best validated of the projective techniques is the Rorschach. This is a series of ten plates depicting symmetrical ink blots, some in black and white, some with touches of color, and three all in bright colors. The subject is asked to tell what he sees in each blot or what the blot makes him think of. This was devised by Hermann Rorschach (23), a Swiss psychiatrist, and the results published in 1921 after some ten or more years of experimentation with the responses of different types of mentally disordered patients. Rorschach paid little attention to the content of the response, but drew conclusions from the formal characteristics of the answers. He found that different psychiatric types give responses having distinctive characteristics and from these findings he was able to develop his experimental method into a test of the nature of personality structure. The Rorschach method is now recognized as having positive clinical value. Rorschach's experimental findings are clearcut enough that certain of the major differences can be interpreted blindly with considerable confidence. Since the Rorschach is treated in a separate article in the encyclopedia, it is not described further here.

Another test which is now recognized as a standard instrument is the Thematic Apperception Test (already referred to in this article) devised by H. A. Murray and Christine Morgan (19). This might be called the picture-story method for in it the subject is presented one by one with a series of pictures, and is asked to make up a story which the picture suggests. After looking at the picture the subject is asked to tell a story which would relate the events leading up to the situation depicted, to tell what the characters in the picture are saying, thinking, or feeling, and then to tell how it will turn out. In the present series twenty stories are obtained—ten each on two

separate days. The stories which this method yields are valuable particularly for interpretation that may be made of their content. The subject projects his own impulses, trends, wishes, anxieties and moods into the characters with which he identifies himself. These trends often are not those which find expression in the subject's contacts with the world and which give him his personality and reputation, but are those which are hidden and repressed. But these trends may find expression in stressful situations or in disguised ways through various mechanisms. Interpretations of the Thematic Apperception Test cannot be reduced to set rules and formulae, but must depend on the intuition and insight of the examiner and only in conjunction with other facts concerning the life history and personality of the subject.

Other projective techniques are still in an experimental stage and will not be mentioned here. Naturally such techniques as painting, finger-painting, drawing, clay modeling, and free play with toys do not require prepared material, and are not dignified by special titles.

Projective techniques represent a powerful method of investigating the motives and personality trends of an individual, particularly those which lend themselves to dynamic interpretation.

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PROPAGANDA.—The term "propaganda" came into prominence as a result of the war years, 1914-1918, but propaganda as a technique of influencing behavior by the manipulation of words and other symbols has a long history. Signs have been discovered on the walls of ancient cities which are essentially political appeals. In the seventeenth century, Pope Urban VIII established the *Congregatio de propaganda fide* which was to be concerned with the training of missionary workers and the spread of the Roman Catholic faith. During the Civil War the United States Government sent many agents to England to plead the Union cause. It was World War I, however, which served to make most Americans familiar with the word propaganda and to cause them to associate with it a feeling of evil and sinister intent.

The tendency to consider propaganda as something basically "bad" has led to many attempts to differentiate between propaganda and education. Doob (1935) insists that the distinction is one as to whether or not the same end result would have been achieved with or without the use of suggestion. If suggestion is necessary to achieve the goal then propaganda is involved; if the same goal would have been achieved without the use of suggestion, then this is called education. LaPiere (1935) attempts to make a distinction between propaganda and education by stating that the efforts of a majority to convince a minority might be called education, whereas the efforts of a minority to convert a majority might be called

propaganda. Many other attempts have been made to separate propaganda and education, either on the basis of the end result achieved or on the basis of the methods involved. Despite these many efforts, however, propaganda and education, from a psychological viewpoint, seem to be closely related.

Both propaganda and education are primarily concerned with the use of symbols as means of influencing behavior. More technically, in a psychological sense, propaganda is the systematic attempt to manipulate a stimulus field in such a manner as to control the psychological structures of groups of individuals and thus to control their actions. This definition, however, must be understood in terms of its component parts.

"To manipulate a stimulus field" means to structure the stimulus field so that it tends to be perceived in accordance with the desires of the propagandist. "The stimulus field" may consist of events, objects, conditions, and—what is more important for propaganda—symbols representing these things. "To control the psychological structures" means to arouse, weaken, reinforce, bring about a new integration, or to modify the psychological structures. The term "psychological structures" refers to the determining tendencies, attitudes, beliefs, values, opinions, and stereotypes, which have been incorporated within the individual as a result of previous experience and past learning. "Groups of individuals" may consist of national, occupational, political, religious, or any other potential groupings. By so influencing the attitudes and opinions of these groups, the propagandist hopes that their behavior may be directed into desired channels. The intention may be to inhibit certain patterns of behavior or to evoke others. The actions themselves may consist of such patterns as obedience to law and authority, voting, rioting, or buying.

Accepting the definition of propaganda proposed, there is no basic difference between propaganda and education. Attempts to characterize propaganda as emotional and education as rational are not practical when, as a matter of fact, much propaganda is rational and much education is emotional. To say that education is no longer education but is propaganda when it becomes emotional is to draw a fine theoretical distinction that has little relationship to reality.

It is sometimes said that education is concerned with facts and that propaganda is not. This is simply drawing another distinction that does not hold in practice. Education, like propaganda, is concerned not just with facts, but with facts in a context. As Erika Mann demonstrates in *School for Barbarians* (1938) even arithmetic as taught in the German schools under the Nazi regime contributed to the "Nazification" of school children. Ellis Freeman (1936) has made a similar point in connection with the teaching of elementary arithmetic in America. School children in the southern states do not get the same historical picture of the Civil War as children in the northern states. And American school children do not get the same perspective of the American Revolution as do children in England.

Facts alone do not result in a well balanced education, nor do facts alone result in efficient propaganda. Propaganda, like education, includes the interpretation of facts in order to bring out their significance and in such a way as to influence beliefs and behavior.

In the early days of World War II, Elmer Davis, Director of the United States Office of War Information, made the following statement concerning America's propaganda activities: "To the Allied countries and the occupied countries we have to tell the story of what American is doing and what America is getting ready to do, to tell them the story of American production and to make them realize that we are going to win. . . . And to the enemy countries we have to keep telling that same story until they too realize they must believe it—that we are going to win." The point which is implied in this statement is that no communication is effective as propaganda until it makes people realize something that they didn't think of before or has some other effect on beliefs, opinions, and attitudes. It is obvious that not all facts will be of equal importance in accomplishing this objective. But even "selected" facts must be given the proper interpretation if the maximum propaganda value is to be gained from them.

The propagandist takes an event or set of facts and places upon the event the interpretation that he desires. Or he describes the event in such a way that his interpretation will be accepted. If the event cannot be treated in the desired fashion, then the propagandist may

choose to ignore it completely. The techniques which he may make use of include: (1) *distortion* or twisting the facts to get across his point; (2) *suppression* or the failure to touch upon the event at all; (3) *fabrication* or the description of some imaginary event; (4) *diversion* or the placing of emphasis upon one event in order to distract attention from another; (5) *selection* or the use of only limited aspects of the event with neglect of others equally important; (6) *simplification* or reducing the complexities of a situation to a simple formula.

The Institute of Propaganda Analysis has listed seven devices which are commonly used in propaganda activities: (1) *name-calling* which involves labeling an issue or an opponent with a "bad" name in an attempt to arouse negative feeling tone; (2) *glittering generalities* or the identification of a program with "virtue" words such as "liberty" or "freedom" in an attempt to arouse positive feeling tone; (3) *transfer* which is the attempt to carry over the prestige of some authority or institution to the ideas of the propagandist; (4) *testimonial* or the quoting of approval of the propagandist's ideas by persons in positions of prestige or authority; (5) *plain folks* in which the impression is conveyed that the propagandist's ideas have their origin in the masses; (6) *card stacking* which is the use of deception and false statements; (7) *band wagon* which is an attempt to give the impression that the program is being taken up by the vast majority.

It is obvious that many of the so-called propaganda devices listed above can be subsumed under the general principles of association or conditioning. The principles of association are, as a matter of fact, basic to all propaganda. The propagandist can only hope to control behavior by using stimuli, usually words, which will arouse in the individuals being propagandized the associations which the propagandist desires. The propagandist must at all times capitalize upon the existing psychological structures in the group being subjected to his propaganda.

The use of propaganda during time of war and as an aid to the military defeat of a country is technically known as "psychological warfare." Psychological warfare, like propaganda, is not new. It was used by Genghis Khan who, among other things, sent agents ahead of his

army to spread rumors that the Mongol hordes were coming, spreading death and destruction to all who opposed them. Despite the fact that the Khan's forces were in many instances outnumbered, the rumors often proved effective in producing submission without actual fighting. The Khan was using symbols as a means of influencing behavior.

The difference between ancient and modern psychological warfare rests largely in the development of modern means of communication, radio in particular, which can be used to spread propaganda. World War II saw the use of government-sponsored radio broadcasts to other countries for propaganda purposes. But in addition to these openly sponsored broadcasts by various governments, World War II was also instrumental in developing the "clandestine" or "secret" radio station. Clandestine stations purport to be located inside of some country other than the actual country from which they are broadcasting. Germany, for example, sponsored several stations located in Europe but which claimed to be located in England and which the Germans pretended were operated by dissident elements within England. Clandestine stations are used to spread rumors, lies, slander, and all manner of material that official stations cannot afford to touch. Official stations commit their governments publicly. If they issue lies and misinformation the reputation of the government sponsoring them suffers. Clandestine stations can afford to be irresponsible since they pretend to be located inside of the country attacked. If they prove unreliable no harm is done the actual sponsor.

In World War I leaflets were used as means of spreading propaganda to combat troops. These leaflets usually played upon the attitudes of the enemy in an attempt to get him to surrender. They often promised good food and treatment if he would surrender and death and destruction if he did not. Trench mortars were used to shoot bundles of leaflets across enemy lines. Balloons with timed fire fuses for the release of packages of leaflets were set off with favorable winds. Planes were used to some extent also for dropping leaflets.

In World War II, the bombing plane with its long range flights and carrying capacity was the modern method of leaflet distribution. Leaflets were printed in the form of wrappers for

small cakes of soap and dropped to enemy civilians. Messages were also printed on match covers, and on wrappers for needles, thread, shoe-laces, candy, and other useful articles. British and American bombers dropped thousands of small newspapers printed in many different languages over Europe. These small papers when rolled approximated the size of a cigarette. Fine print enabled them to carry about 10,000 words. The papers were put to press just before an air mission in order to include the latest news. Special editions covering the speeches of Prime Minister Churchill and President Roosevelt were published and distributed. Decisions reached at Teheran and Yalta by the Allied powers were rapidly made known to Germany in the same fashion.

Bruntz (1938) has attempted to evaluate the effectiveness of Allied propaganda in the defeat of Germany in World War I and the importance which the Germans themselves attached to propaganda as a factor in their defeat is attested to by the documented reports in *German Psychological Warfare* (1941). Although no complete report has yet been made public concerning the effectiveness of Allied propaganda during World War II, its value has been publicly acknowledged by many Allied military officers.

During the interval between the two wars, social psychologists have carried on extensive research on changes in attitude as a result of propaganda. In selecting but a few of the many studies in this field for mention, the classical work of Peterson and Thurstone (1933) on changes in attitudes of children as a result of viewing motion pictures cannot be overlooked. Groups of children were tested by means of attitude scales before and after viewing pictures designed to change their attitudes. In many instances very definite shifts occurred between the two tests. Other investigators have concerned themselves with the effectiveness of speeches, printed material, radio talks, discussions, and so forth upon changes in attitudes. A study by Annis and Meier (1934) has demonstrated that it is possible to create favorable or unfavorable attitudes toward an unfamiliar individual by means of "planted" editorial comment. Hartmann (1936), in a field experiment on the effectiveness of rational versus emotional appeals, reaches the conclusion that emotional propaganda is much more effective than ra-

tional. But whether this generalization would hold with groups at all intellectual levels is not known.

Despite all of the research in the field of propaganda, little effort has been directed toward a systematization of this research in terms of general principles and rules. Political scientists have been largely interested in historical descriptions of various propaganda campaigns and psychologists have perhaps been too much interested in the measurable change in attitudes as a result of propaganda. What is needed now is an analysis of the basic psychological processes involved in attitude change. Some starts have been made in this direction by Doob (1935), Newcomb (1943), and others, but there still remains much to be done.

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PSEUDOPSYCHOLOGY.—The term covers a number of unscientific methods of judging personal traits and vocational abilities and

predicting life events; it also includes outpourings in the form of lecture series and sundry publications purporting to be sound psychology but in reality the work of uninformed persons.

*Palms*try, or chiromancy, is the oldest of the methods. No one knows when palm-reading first began, but in China it is said to have been in vogue at least three thousand years before Christ, and the oldest Greek writings refer to it as a familiar practice. At present it is well known in most parts of the world and extensively used in China, India, Syria, Egypt, and Arabia. The Chinese also used pedomancy, or divination from observation of the soles of the feet. In both palms*tr*y and pedomancy the characteristics of the hands and feet, especially the creases and muscular mounds of the palms and soles, are believed to have specific meaning. In the past there were often differences of opinion as to interpretation, but at present most chiromantic authorities agree rather closely. For instance, the formation and size of the "mountain of Venus," the muscular swelling at the base of the thumb, is commonly supposed to indicate the kind and degree of love, i.e., whether the individual is loving, lustful, or charitably-minded, and to what extent. The line at the base of "Venus" is the "line of life"; its length, interruptions, terminations, etc., are believed to reveal the course of life. There are hundreds of lines, crosses, triangles, swellings, etc., which have been interpreted. The general shape of the hand, its dryness or moisture, softness or hardness, and so on, are also sources of information as to personal traits and the future.

To those who understand anatomy these explanations are absurd. The lines and swellings of the hands and feet are actually due to mechanical necessity. The thick skin of the palm must necessarily be creased so that the hand can bend to grasp; the formation of the folds depends on the arrangement of fibrillar tissue which binds the skin in place. The mountain of Venus is merely a muscle which can be developed through exercise like muscles in general, and its size cannot conceivably have any correlation whatsoever with love, lust, or charity. There is no valid reason for supposing that any of the lines and prominences should be explained in the fanciful fashion of palms*tr*y of the usual type. However, Dr. Charlotte Wolff, in her book *The Human Hand* (1943), tries to build a case for an improved kind of

palms*tr*y based on her theory that characteristics of the hand disclose operations of the brain and other physiological activities. Josef Rana*ld* takes a rather similar position. Neither of these authors uses the rigorous experimental procedure of academic psychologists in the United States. In the attempt to make palms*tr*y scientifically reputable, it is sometimes subdivided into chiromancy, or foretelling the future, and chirosophy, the interpretive science of the hand.

Physiognomy is the art of judging mental traits from the body lineaments and other physical characteristics, especially those of the face. It may also include predictions regarding vocation and general fortune-telling from appearance. In this field a great deal of unverified opinion has been interspersed more recently with scientific investigation. The practice of physiognomy is a very old one, still thoroughly supported in literature and popular belief. Persistent crude attempts to read character from form and feature are made by many persons. Some take advantage of human credulity to promote financially profitable "systems" which claim to discover vocational abilities. Popular physiognomy leans heavily on the common tendency to see analogies and draw unwarranted conclusions therefrom. The features are generally taken singly for interpretation. A prominent chin brings to mind prominence of such a vigorous trait as will power; a bulldog-like expression suggests the tenacity characteristic of that animal; a coarse skin must mean coarseness of nature, etc., etc. Certain other factors also obviously operate in diagnosis. For instance, what is known psychologically as "set" is often present. If one believes and expects blondes to be "changeable" and "variety-loving," as the physiognomist's manual says they are, it is much easier to discover these traits than if there is no such set, or a different attitude altogether. Again, there is a strong human propensity toward remembering only those instances when the similarity is substantiated and overlooking all disagreements.

There have been a variety of commercial systems of physiognomy on the market. In 1922 Kornhauser and Jackson circulated a questionnaire among a hundred industrial employment managers and insurance agency managers inquiring whether or not they used systems of this kind. About 6 per cent were found to do

so. Probably such systems are less used than formerly, but one of the best known of those popular in 1922 is still listed in a bookseller's "Success Catalog" for 1945. Experimental investigations of the methods always show the latter to be untrustworthy. In one study, Paterson and Ludgate submitted to about one hundred persons lists of traits supposed to be characteristic of blondes and brunettes. The judges, who were unfamiliar with the claims made by promoters of the system, were asked to think of two decidedly blonde persons and of two strongly brunette ones. Each was to be rated plus or minus on every trait, according as to whether or not it was possessed by the individual. There were wide discrepancies in results. Blondes often had "brunette" traits, and brunettes had the characteristics of blondes. Results were varied but there were even some reversals in ratio. For example, 84 per cent of the brunettes were judged "positive," a supposedly "blonde" characteristic, as against only 81 per cent of the blondes; and 64 per cent of the brunettes had the "blonde" trait of dynamicness, with 63 per cent of the blondes so rated. Cleeton and Knight undertook to investigate the relationship between eight character traits and the physical features said to be indicative in several popular systems of physiognomy. They made a total of 201 careful measurements on thirty persons. They then compared their findings with the judgments of intimate associates of the subjects and also with those of strangers. There was no correlation at all in the former case and a practically zero one in the latter.

Yet it must be admitted that the commercial physiognomist and many other nonscientific observers are frequently fairly correct in their conclusions. Obviously there are other clues than skin color and texture, size and shape of features, etc. Investigation shows that these other clues lie in such sources as expression, manner, way of speaking, dress, and frequently the unanalyzed total impression conveyed. The confident individual is likely to have an air of confidence implicit in many details of appearance. The optimistic person probably has an expression of cheerfulness and optimism. The very successful man radiates success because his repeatedly successful actions have resulted in the habitually energetic, commanding bearing we associate with success. In like manner the

facial muscles of those who are constantly gloomy may settle into fixed lines of depression. Or kindness may seem to shine from the eyes of the kindly, though in reality the eyes do not change. It is the eyelids and the muscles of the face which are capable of being molded by habit. Psychologists have given a good deal of study to the kind of behavior they call "expressive movement," like facial changes, gait, and gesture. Word pronunciation, vocabulary, quickness or slowness of response, kind of clothing, make-up, appearance of hands, manners or lack of them, are more details which give information about a person's past, present, and future. From time immemorial fortune-tellers of all kinds have, consciously or unconsciously, built their business on such signs.

In predicting vocation there are certain other factors which aid the forecaster. Most persons can succeed not only in one field but in several, a fact which greatly increases the possibilities of correct prognostication. Then, too, the individual's likes and dislikes, easily ascertained in conversation, are indicative of his abilities, for the accredited psychologist has found some correlation there. Furthermore, advice offered by a person posing as an expert may produce a helpful instigating "set" leading to success. In any event, as has been said before, human nature is such that only those predictions which are fulfilled are likely to be remembered and reported to others.

Further light is thrown on the subject by attempts on the part of genuine scientists to relate mental traits to general type of body form and structure rather than to specific features. This approach goes back even to Hippocrates (d. 377 B.C.), the first lay physician of Greece, who distinguished two fundamental physical types, the *apoplectic habitus* with short, stocky body, and the *phthisic habitus* of long, thin form. These are the prototypes of the *pyknic* (compact) and *asthenic* (without strength) types described by Kretschmer, the German psychiatrist, in 1921. He observed that his manic-depressive patients generally fell into the former classification; the schizophrenics, on the other hand, were likely to be "asthenic," or perhaps "athletic," a third grouping descriptive of those more muscular than stout or thin. By analogy normal persons were said to be of at least two kinds of temperament, "cycloid" and "schizoid." In the pathological field some cor-

roboration of Kretschmer's theory has come from the work of Wertheimer and Hesketh, Farr, and Mohr and Gundlach. In the last quarter of the nineteenth century Lombroso in Italy advanced the hypothesis that criminals were likely to exhibit "stigmata," that is, physical abnormalities which were evidence of degeneracy or atavism. Goring later upset Lombroso's observational claims by taking precise anthropometric measures of a large number of English criminals and obtaining mostly negative results. But Hooton at Harvard, using criteria that appear to pertain more to general body type, has recently found statistically valid relationship between criminality and physique in American convicts. The Italian anthropometrists under Viola's leadership have recognized three morphological types, the *macroplanchnic*, the *normoplanchnic*, and the *microplanchnic*, a trichotomy suggesting Kretschmer's. One of Viola's pupils, Naccarati, who came to the United States, endeavored to correlate intelligence with an index of physique derived from ten body measurements. His studies, in 1921, of several groups of Columbia University students showed positive correlations but too low to be significant. Many similar attempts were made by others to correlate intelligence and single parts of body structure, like head size and face length, but again nothing better than low positive correlations were secured. D. G. Paterson in *Physique and Intellect* (1930) has expressed the point of view of many American psychologists who have seriously questioned the concept of correlation between physique and mentality at least in normal persons.

The most careful study of body types yet made is the recent work of W. H. Sheldon at the University of Chicago and Harvard. He first found that the general factor of bigness with horizontal breadth offered a low negative correlation with intelligence test scores and "emotional excitability"; and a low positive correlation with the social traits of aggressiveness, leadership, and sociability. Subsequently he obtained very exact measurements from standardized photographs of four thousand undergraduate male college students, in front, back, and side view. He identified three extremes of physique, and was thus able to derive his terms for the essential components of form: (1) *endomorphism* (soft roundness predominating); (2) *mesomorphism* (muscle, bone, and

connective tissue outstanding); and (3) *ectomorphism* (linearity and fragility conspicuous). This classification corresponds roughly to Kretschmer's, but seems to represent distinctly more accurate analysis and delineation. Sheldon seeks to avoid both confusion and rigidity in typing by proposing, in his *The Varieties of Human Physique* (1940), a seven-point scale for "somatotyping" individuals on each of the three components; and he emphasizes the concept of the continuum rather than fixed typical point.

He has identified corresponding types of temperament and devised a rating scale on the basis of extensive interviewing and observation, and use of a variation of factor-analysis technique. *Visceratonia* is said to be the correlate of endomorphism and is "roughly identifiable with love of comfort, relaxation, sociability, conviviality, and sometimes with gluttony. . . . *Somatotonia* is the motivational pattern dominated by the will to exertion, exercise, and vigorous self-expression. . . . *Cerebrotonia* refers to the attentional and inhibitory aspect of temperament. In the economy of the cerebrotonic individual the sensory and central nervous systems appear to play dominant roles." In *The Varieties of Temperament* (1942), Sheldon describes his seven-point scale for rating sixty traits, twenty under each of the types. Sample items are as follows: (1) for visceratonia, "relaxation in posture and movement," "love of physical comfort," "evenness of emotional flow"; (2) for somatotonia, "need and enjoyment of exercise," "competitive aggressiveness," "overmaturity of appearance"; and (3) for cerebrotonia, "overly fast reactions," "love of privacy," "self-conscious motility of the eyes and face." To obtain "a full constitutional analysis" there should be "not less than twenty analytic interviews" over a period of "at least a year." However, for special purposes Sheldon also suggests shortened procedures, even including a single twenty-minute interview. Scrutiny of the complete scale and directions for rating shows that conclusions are to be based largely on present appearance and behavior and the subject's report of his past activities. The medical history as well as the life history is always taken, and special topics investigated or extra tests given when the need is indicated. The Wisconsin Scale of Radicalism and Conservatism and the Chicago Scale of Mental Growth have been used. With the abbreviated twenty-minute form the examiner observes some sim-

ple actions, such as the subject twisting a broom handle or walking the length of the room. Sheldon stresses the need for clinical training and great keenness of observation on the part of the examiner. It is to be a "constitutional approach"; the components of temperament are "tied back to and interpreted in terms of basic components of morphology."

All this is a far cry from the commercial physiognomist's interpretation through superficial analogy and snap judgment unchecked in any way. The characteristics observed in the two procedures are not identical, and the methods of observing are very different indeed. Sheldon believes that balances and ratios among physical elements, rather than single factors, are important. Moreover, his conclusions regarding temperament are apparently drawn quite as much from the reactions and past history of the individual as from the appearance. He does not find the correlation between morphological and temperamental levels of personality to be perfect, but it is high—about +.80.

It would be premature to attempt a final evaluation of these various anthropometric researches, but two further physical factors, the endocrine glands and the nervous system, should be mentioned as pertinent in a discussion of physiognomy. The endocrines are known to influence growth and development, both mental and physical. Sheldon, in commenting on this fact, shows his particular point of view: "What can be caused by a given glandular secretion may be one thing in one type of body, but something quite different in a member of another somatotype. Hence the search for single causes must give way to analysis in terms of correlated variables." Present scientific opinion usually gives a more crucial position to endocrine function than his first statement implies. The belief is that a good many characteristics, including fatness and thinness, bony growth, and dispositional traits like energy and sex drive, may sometimes be a direct result of glandular secretion, though few would gainsay the importance of other factors as well in personal development. Paterson shares Sheldon's lack of enthusiasm for the glands of internal secretion as explaining personality, but offers a different interpretation. His point of view, expressed before publication of Sheldon's study, is one which has been widely subscribed to by scientists. Briefly put, it is that the real correlative of

personality and mental traits in general is the nervous system, more particularly the brain. If this is true, then bodily contours are not a very productive source of information regarding mental traits. No person interested in the claims of physiognomists should ignore any of the scientifically grounded theories and studies so far offered.

Phrenology is a phase of physiognomy which developed independently. It can be defined as the study of the conformation of the skull as indicative of mental traits and abilities. In more popular language, the "bumps" of the head are supposed to house mental characteristics. This pseudo-science was founded by Francis Joseph Gall (1758-1828), a native of Germany. After he graduated from the University of Vienna, he interested himself intensively in the structure and functions of the nervous system. In 1796 he first announced his ideas as to the localization of faculties in the brain. Gall made efforts to approach the problem from a scientific standpoint, but it must be remembered that the science of his time was very limited. He studied the heads of many persons, sometimes drawing conclusions from few instances, again using a great deal of human material, but without what we now consider scientific criteria. He even examined insane persons and criminals in institutions, and dissected the brains of those who died there; he also dissected animal brains. Gall was well informed, for his time, on the anatomy of the nervous system, though not on its physiology. He pioneered in describing what we at present know as afferent and efferent nerve pathways. And he can be credited with being among the first to glimpse the psychology of individual differences. While his knowledge seems inadequate to us, it was too advanced for that period. In 1802 his lectures were banned by the Austrian government as dangerous to religion, and Gall was accused of making the soul a function of the brain and not something given to man directly by God. Later in Berlin and Paris his ideas were strongly opposed by some and enthusiastically received by others.

Phrenology as developed by Gall and his followers, especially J. K. Spurzheim and G. Combe, has five basic principles: (1) the brain is the physical correlate of the mind; (2) man has a definite number of independent mental faculties; (3) these faculties are inborn and

each is located in a specific part of the brain surface; (4) size of such regions correlates with amount of the concomitant faculty; (5) examination of the outer surface of the skull makes clear how much of each mental power an individual possesses. The phrenologist's chart in final form locates thirty-six faculties. The "propensities" are: amativeness, philoprogenitiveness, concentrativeness, adhesiveness, combativeness, destructiveness, alimentiveness, secretiveness, acquisitiveness, constructiveness, and vitativeness. The "lower sentiments" are self-esteem, love of approbation, and cautiousness. And the "superior sentiments" comprise benevolence, veneration, conscientiousness, firmness, hope, wonder, ideality, wit, and imitation. The "perceptive faculties" consist of individuality, form, size, weight, color, locality, number, order, eventuality, time, and language. Completing the list are the "reflective faculties" of comparison and causality.

Psychologists and physiologists certainly agree with the general thought of the first of the phrenologist's postulates, and are convinced that the brain is at least the major correlate of the mind. But the other four principles are no longer accepted by science. What completely upset Gall's theory of localization of faculties was the discovery that there is a different kind of localization in the brain. During the Franco-Prussian War an army surgeon, Fritsch, noticed that electrical stimulation of a brain exposed through injury resulted in muscular movement. It was found that such movements were specifically related to certain brain areas, e.g., if just the right portions of the brain at the top of the head were touched or stimulated electrically, jerking of the legs would result. The various kinds of sensations were also discovered to be localized. For instance, we now know that the base of the brain at the rear (where Gall put "philoprogenitiveness," or love of children) is concerned with vision; and the area around the ears (Gall's place for destructiveness), with hearing. It should be added that there is still question as to the degree of localization of function indicated by the evidence. Since many parts of the cerebrum must be involved during much of our thinking, psychologists often prefer to say that the brain can be thought of as operating habitually in wide-spreading patterns of neural energy. There is no possibility of the

existence of specific places in the brain where the Gallian faculties reside. Many of these are in fact very complex, and necessarily lead to ways of behaving which depend on operation of much of the brain; others seem to be too circumscribed to fit the physiological facts.

Another argument against the phrenologist's localization of faculties comes from studies of the results of destruction of parts of the brain through injury. Such losses show no correspondence with the Gallian disposition of traits. Furthermore, the phrenologist's idea of size as a sign of mental development is baseless. Some individuals with unusually large heads are feeble-minded because the skull contains an inadequate amount of brains and an over-supply of cerebro-spinal fluid. In such cases certain parts of the cranium are extraordinarily well developed, but there is no analogous increase in the faculty supposed to be there.

Phrenology is now not entirely defunct, but has been taken over by fortune-tellers, sham psychologists, and other persons of exceedingly dubious reputation. A report of one individual of this description comes from a soldier at a large army camp of the Second World War. The phrenologist in question made very successful efforts to attract the patronage of the draftees, advertising himself unambiguously as a "bumpologist."

Graphology is the art or science of discerning characteristics of personality from handwriting. In popular judgment in the United States it has been accepted with the same eager credulity evinced toward palmistry, physiognomy, and phrenology. Similarly there are "practical applied graphologists" who promise—for a financial consideration—expert guidance in personality development, vocational and marital selection, and, in fact, in practically all human problems, even including elimination of war! It is little wonder that accredited psychologists in this country are apt to regard graphology as the province of quacks and scientifically worthless. In Europe, on the other hand, the situation is different. There scholarly interest in the subject and legitimate investigation have flourished.

It is hard to say when handwriting as a means of personality diagnosis first attracted attention. Toward the middle of the seventeenth century Camillo Baldo in Italy published his treatise on graphology. The modern period can

be said to have been initiated around 1860 by the Abbé Michon in France. He and his pupils tried to build up a trustworthy set of criteria by looking for similar characteristics in the writing of persons possessing a certain trait to a marked degree. As a result of their studies what is known as the "sign" method developed. A "sign" is a detail of script, such as a's open at the top or high capital letters. An elaborate series of "signs" was finally recognized. Eventually a number of American psychologists began to evaluate the claims of graphologists through experimental test, but with largely negative results. June Downey in 1919 called attention to fallacies of unsupported analogy. For instance, without due validation disconnected writing was declared to be a manifestation of disconnected thinking, and long upward strokes, of "upward" (idealistic) inclinations.

In the same year Hull and Montgomery reported a study of the handwriting of seventeen college fraternity brothers. The signs, which were measured microscopically, included upward slant in alignment, fineness of line, lateral narrowness of m's and n's, length and heaviness of t-bars, and closed a's and o's. The subjects were asked to rate each other on the traits supposed to correspond to the "signs," i.e., on ambition, pride, bashfulness, force, perseverance, and reserve. The correlations turned out to be either negative or very low, the average of all correlations being $-.016$, or almost zero. This overwhelmingly adverse finding has been much quoted by psychologists and other scientists in the United States, many of whom have little other information on graphology. However, Downey and Gordon Allport (writing in 1933 in collaboration with British-born Philip Vernon) upheld the growing European belief that handwriting was a significant form of expressive behavior which, if properly studied and interpreted, would be a sound source of knowledge concerning personality. In *Studies in Expressive Movement* Allport and Vernon raise objections to the study of Hull and Montgomery. The findings of the latter regarding "signs" are criticized as follows: "Practically no graphologist at the present time, certainly not the leading authorities, claims any fixed and invariable significance for any of these 'signs.' Although borrowing in part from the signs listed by Crépieux-Jamin, the investigators

omitted entirely his doctrine of 'resultants.' No attempt was made to balance and synthesize the signs or to work with the form-quality of the whole script."

This criticism suggests a position different from that held by the earlier graphologists. Further quotation from the same authors will make clearer the new viewpoint: "Most of the experiments devised by skeptical psychologists, who seek correlation between specific details of script and specific traits, are foredoomed to negative results. If we are to attain the most adequate validation, *the script as a whole and the personality as a whole must somehow be compared*. . . . Some experts, notably Saudek, incline to base their interpretations on a scientific analysis of the numerous factors involved in handwriting. Others rely chiefly on general impressions and *Formniveau* [total impression]."

As Allport and Vernon indicate, the era of signs has been almost completely replaced by one in which general factors and interrelationships of script are the basis for diagnosis. European inquiry into the subject of graphology has continued steadily. There is a large and increasing body of information brought forward by authorities. After Michon the distinguished psychologists Wilhelm Preyer and Alfred Binet were among the earlier authors to produce careful studies in the field. Germany and France have had many exponents of the subject. In Germany, Klages, Meyer, and Bobertag are some of the well-known twentieth-century writers on graphology; in France, Crépieux-Jamin, a pupil of Binet, probably has the widest reputation. Saudek, writing in both German and English, has been very active in graphological investigation. There has been appreciable interest in it in England and also in Holland. Study of handwriting has proceeded along a number of lines. Koester, de Fursac, Hirt, and Gross found characteristic penmanship in the different mental diseases. Couvé, von Kügelgen, and Seesemann have reported satisfactory vocational diagnosis through script in the industrial and personnel fields, though critics point to some errors in validation. Two important methods of application have emerged, viz., (1) the *sorting* method and (2) the *matching* procedure. An example of the first is Saudek's sorting of unfamiliar handwriting samples by detecting through his own criteria which of the

writers were honest and which dishonest. The second method has several variations, but usually the judges "match" specimens of penmanship (or graphological analyses) with known persons or with personality descriptions. By any method it is found that in general the graphologist is a more successful judge than the inexperienced individual, though results are far from perfect with the former and show considerable variation in accuracy. Furthermore, entirely untrained individuals are sometimes highly proficient.

Handwriting is looked upon by authorities as expressive behavior like gesture, gait, or facial expression. Allport and Vernon vigorously testify to the graphologist's belief that expressive activities in general are related to each other in well-patterned association, and that all such movement is congruent with personality traits. These authors have performed experiments proving "inter-muscle consistency," thus supporting the previous demonstrations of Preyer and Saudek that a person's writing is much the same whether it be executed by his right hand, left hand, toes, or mouth. The uniqueness of basic quality in handwriting is further evidenced by hereditary resemblances in writing and distinctive variations in the script of individuals reared in the same school of penmanship. Some graphologists analyze the movements of the hands and variations in pressure and speed. Many factors such as age of the writer, the penmanship system he has been taught, his health and present mood have been found to complicate determination of personality from handwriting. American psychologists have contributed some excellent studies of the psychology of graphic movement, which may help toward a firmer foundation for graphology. But details as to the research aspects of the subject are beyond the scope of this article. There is little doubt that handwriting is genuinely characteristic of the individual, and that it is a form of expressive behavior, though the precise manner of expression is not yet entirely clear.

Recent immigration has given American psychologists close-range acquaintance with the concepts and work of a number of European graphologists of the newer school. Eliasberg's interpretation of the handwriting of Hitler, Goering, Goebbels, and other political figures appeared in *The Journal of Psychology*, Octo-

ber, 1943. Marseille has been employed by Spiegel's, Chicago mail-order house, to determine through examination of handwriting whether or not prospective customers are "good risks." In their book *Handwriting Analysis* (1942), Mrs. Thea Stein Lewinson, from Berlin and Paris, and Joseph Zubin, whose doctorate is from Columbia, have attempted to put graphology on a genuinely scientific basis by providing a statistical method for checking results. But in spite of these and other efforts American psychologists for the most part do not show much interest in the subject and are not well informed about it. They are repelled by the nonquantitative, "intuitive" approach and the inexactness of terminology so frequent in graphological studies. Moreover, the prevalence of much quackery in this country obscures possibilities in graphology. To the critically minded it still seems at best more of an art than a science at the present time.

Spurious Psychology. Between 1920 and 1930 a distinctly unauthoritative kind of psychology was at the height of its popularity. D. H. Yates describes this movement in *Psychological Racketeers* as taking two general forms, (1) the lecture series and (2) published material of many kinds, conspicuously "systems of applied psychology." The author or itinerant lecturer was a person untrained in scientific psychology whose chief aim was to capitalize on current enthusiasm for psychology as popularly understood. Before the tuition lecture series came abundant advertising and several free lectures replete with tantalizing hints of what was to follow. Course fees ranged from ten to fifty dollars per person. Since the "psychologist" generally stayed less than two weeks in any one town and a good spellbinder could attract a large audience, the proceeds must sometimes have been enormous. These were augmented through side offerings such as extra courses or lectures, and books and pamphlets by the lecturer, or specialties like phrenological examinations, handwriting analyses, and vocational diagnoses through physiognomy of the commercial variety. The published "systems" provided another medium for "applied psychology," and were promoted in correspondence courses or book form. Here again prices were high. However, it was always asserted that "rates were greatly reduced"; they were reduced still further if the prospective purchaser

was excessively recalcitrant in responding to numerous letters of advertisement. Yates found upon investigation that there was considerable use of unauthorized endorsement.

The vendors of this kind of psychology exhibited no knowledge of academic psychology or psychologists. In the lectures there was almost total absence of allusion to any accredited psychologists. In all Yates' extensive collection of literature on "applied psychology," she found only an occasional superficial reference to Freud or to William James. The writer or lecturer concocted a mixture of ideas borrowed from Christian Science, Coué, Yoga, other "applied psychologists," and his own imagination, which was sometimes very wild indeed. Unbelievably bizarre statements and fantastic promises appealed to the uninformed who wanted "health, happiness, and success." These self-styled "authorities" obviously set out to cater to fundamental human desires, and their stock slogan was "the power of thought." Their unmistakable objective was money for themselves. A very few were probably self-deluded but well-intentioned persons "not above indulging in a certain amount of hocus-pocus and highly colored assertion to help themselves along," as Yates puts it. At best, these people offered inspiration, encouragement, and some good practical advice. More often they foisted upon the public dangerously misleading notions regarding psychology, medical science, and science in general. They misdirected people vocationally and personally, often causing tragic failure after the arousal of false hopes.

Their type of spurious psychology lessened but did not disappear during depression and war years. A few of the very same itinerant "psychologists" have continued to lecture, though their field of operation was severely limited during the period of travel restriction. Courses and systems advertised by mail have much the same teachings as formerly, but blossom with ever new names. "The Invisible Power League," the "Effective Thinking Foundation," and the "Religion of the Stars" will now enlighten the world. The current fad is certainly astrology. During the severe paper shortage newsstands no longer displayed literature on "applied psychology," but publications on astrology have constantly increased. The contents of these astrological periodicals and horoscopes is a serious reflection on national

intelligence, since astrology is a primitive and thoroughly unscientific attempt to relate the stars to human affairs.

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PSYCHODRAMA.—*Origin and Meaning of Psychodrama.* The first theatre for the psychodrama was founded by Dr. J. L. Moreno in Vienna, in the year 1922. It was called the "stegreif-theater," a German word which can be translated in different ways—"being stirred up," "warming up quickly," "get started," "acting on the spur of the moment." In essence a "stegreif-theater" means a theatre which is dedicated to the spontaneous drama. At that time what concerned Dr. Moreno primarily was the momentary structure of a situation, and how to get the individual started so that he may throw himself into a momentary state. The momentary structure of a situation for spontaneous dramatic purposes, whether suggested by the director or the actor himself, consisted of a situation carefully specified, of a role for the individual actor, and of a number of personified roles by other actors needed to bring the momentary structure to as clear and dramatic an experience as possible—all this to be brought into action on the spur of the moment. Dr. Moreno, being a psychiatrist, developed at the same time, aside from the aesthetic aspect, another aspect of "stegreif," that of the therapeutic—the study and treatment of mental problems by

means of the spontaneous drama. It was in this aspect of development that the momentary "personal" situation of the actor, his private personality, his inner strivings, and his conflicts with people around him became the chief emphasis for diagnosing personality difficulties as well as more severe mental disorders. This information was necessary, moreover, to affect an autonomous treatment and cure. It was realized that he must have charged and tainted all persons and objects of his immediate environment with some aspect of himself, and that this must be traceable in the performance of his bodily and mental functions, in his inner tensions preliminary to these performances, in his gestures and expressions, in the words associated, and in the feelings and movements towards the persons and things with which he lived. Considering the more complex forms of social neurosis, when two, three, or more persons were to be treated simultaneously, the scenes enacted between them became a formidable pattern for treatment. Finally, all the scenes in their remote past and all the remote networks became important from the point of view of a general catharsis of all the people involved. The solution was then the resurrection of the whole psychological drama, or at least of the crucial scenes of the drama, enacted by the same persons in the same situations in which their associations had begun. The new technique, if properly applied, aided the patient to actualize, during the treatment, a situation which was as close as possible to his own life itself. He had to meet the situations in which he acted in life, to dramatize them, to meet situations which he had never faced, which he evaded and feared, but which he might have to meet squarely some day in the future. It was obvious that here was a technique not only valuable as a diagnostic instrument but as a therapeutic one as well, in so far as the subject was able to experience catharsis in the process of unfolding his conflicts, and in finding adequate responses to them on the spur of the moment.

The Stage. The stage¹ consists of a circular

platform of three concentric levels. The levels are representative of levels of psychological processes; for example, the lowest level might be comparable to the conceptual level in the individual's personality; the next level, possibly the visionary level; and the final level, the action level where the realization of the conceptual and visual levels takes place. These different stage levels can also represent different levels of the warming-up process. The catatonic type of personality may take considerable time before he is able to warm up to the point of performance on the third level, whereas the manic type will often literally leap over the first two levels and begin action immediately on the third level. The third level is large enough to accommodate any social situation. The decorative machinations of the conservative stage are absent. Aside from a table, a few chairs, etc., there are no other settings, so that maximum freedom of expression spatially is afforded for the subject and auxiliary egos. The stage consists further of two pillars supporting a balcony upon which the creative ego may realize his imaginary world of grandeur, whether it may be God or the leader of a nation.

A simple system of lights adds to the necessary equipment. They assist in warming the patient up to moods and feelings so that he can more fully throw his psyche into action. If he wishes to portray God in heaven, for example, the blending of red and blue lights gives him the feeling of airiness; all lights out on the stage, except red, give him the feeling of being in hell, where he may want to portray the devil.

The type of audience depends upon the condition of the patient. Often, as in a surgical operation, it is necessary to exclude individuals who are not auxiliary egos and doctors essential in the treatment. If there is an audience, it often consists of individuals chosen by the patient himself, if he does not object to a chance grouping. If he appears to be blocked in his role-playing or hesitant about divulging certain intimacies, he is asked if he wishes to change his original choices. The kind of role in which he functions influences his choices, so that different members of the audience enter and leave the group repeatedly during one session. One or two recorders are always present in order to make stenographic notes of verbalizations, movements, moods, gestures, etc., which the physician needs for analyzing with

¹ The stage described here is the Theatre for Psychodrama at Beacon, N. Y. All other theatres for Psychodrama, for example, the theatres for Psychodrama at St. Elizabeth Hospital, Washington, D. C. (1940), and the one in New York City (1942), are modeled after this design.

the subject after the performance. These records are also necessary for the physician to analyze behavior which suggests need for spontaneity training. At times, gramophone or motion picture records of a session are made and played back to the subject or the audience which was present in the making of them.

The Director. The director, who may be the physician, therapist, or educational director conducts the session, instructs the auxiliary egos, and must be aware of the total situation as it develops. He rarely participates in the action, but stands just off the stage on the side either to encourage the continuance of action if it is lagging or stop the scene at a crucial point for analysis with the subject. Usually, the participants determine the solution themselves.

Important is the director's rapport in his interview with the subject before he goes into action. It is here that the "tele"² phenomenon plays an important part. The stronger the interacting tele is, but particularly the feelings coming from the subject, the better able is the director to warm the subject up to giving the clues for his future action. It is on the basis of these clues that the director explains for the benefit of the auxiliary egos and the subject the problem to be acted out. If there is a negative tele relationship, it is often necessary to eliminate the interview, and place the subject directly on the stage in simple scenes, trusting that the auxiliary egos' intuitive and ingenious action will draw out the needed information. The subject's dependence, in any case, upon the director is reduced to a minimum, and great reliance is placed upon the subject's reaching his catharsis through the aid of the auxiliary egos. The subject may reject the help of all auxiliary egos; then he acts in all roles himself. If the subject refuses to begin action in any of the problems revealed in the interview, the director suggests a plot not obviously related to the problem, thus leading the subject gradually into the crucial issue. Or the subject may choose his own plot, and use this as a warming-up starter for the subsequent plots to be suggested by the director. If he still resists, the auxiliary ego takes the part of the subject, who becomes a part of the audience. After the

performance, or during it, he is asked if the portrayal of himself is accurate and if he would like to come up on the stage and correct any inaccuracies. This portrayal of the subject by an auxiliary ego is called the *mirror technique*. All of these procedures necessitate the director's awareness of which ideas are central throughout the scenes. He must likewise be cautious of introducing sensitive problems too soon. It is not the director's intention to encourage sheer emotional and impulsive outbursts, but rather to gain as much "sane" responsiveness as possible in simple routine life situations leading up to that point where the subject breaks and refuses to face his situation. This is the director's clue for shrewd construction of new psychodramatic scenes which aim either directly or indirectly at the withheld conflict.

There are two kinds of actor catharsis: (a) action catharsis, achieved in the process of acting out conflicts, (b) post-action catharsis, acquired through the director's interview and analysis after the scene has ended.

Auxiliary Egos. An auxiliary ego is a person whose function is to live through the subjectivity of the subject and identify himself with all the patient's expressions as far as organic limitations allow. He must take the roles of the absentee members of the subject's network of interpersonal relations. The auxiliary ego usually does not know the persons he is to represent. He is dependent upon the clues given to the director before the scenes start and the subject's description to him in front of the audience or in a conference backstage as to how they are to be characterized. Even in symbolic roles (Satan, God, or a judge, etc.) he should act only as suggested by the subject, and interject his own vision of the role as little as possible. A good auxiliary ego will be careful not to overact so as not to overpower the subject to the degree of reducing his spontaneous expression. On the other hand, he must maintain an alertness and force which will stimulate the subject to as complete an unfolding of his psyche as possible. In sum, as with the mother who feeds her child, he must absorb the needs and rhythm of his subject so that he can live through his life situation with him, without being, however, so identical with him that he is unable to reserve a certain portion of his ego for objective evaluation.

The auxiliary ego technique of apparent iden-

²Tele is "a feeling which is projected into distance; the simplest unit of feeling transmitted from one individual to another; see Moreno, J. L., "Who Shall Survive?", 1934, page 432.

tification with the patient's delusions, trying to surround him on the stage (and if possible outside of it) with an atmosphere compatible with his fictitious world, is called the psychodramatic realization technique. The door is wide open which leads to the realization of the imaginary world, but *actual* gratification is not attained. On the contrary, it is important to interpolate resistances gradually from session to session, until the patient is able to accept some of his imaginary world as being untrue. By "some," we mean that it is important that the patient never be entirely disillusioned, but aided in realizing a certain amount of his fantasy world in real situations facing him when he returns to his community.

Audience Function and the Sociodrama.

Therapy is not limited to the subject's performance on the psychodramatic stage; members of the audience are likewise deriving therapeutic value by finding maladjustments of the subject as identical with their own. Naturally, the audience members are considered in the director's analysis of the subject's performance, since they will apply it to their own particular problems. Individual members experience, along with the performers, a warming-up process to the roles which they are enacting on the stage. It is for this reason that the director often questions these members as to how they felt about the performers, whether they were in sympathy with one or the other, or how they would have acted if they were in similar roles. Such an audience reaction shows certain portions of the audience in sympathy with the wife, for example; another portion, for the lover; still another, for the husband. These are called *audience constellations*. In analyzing these constellations still further some members find their problems identical with a private problem, others with a collective problem. The husband may be a Jew, and thereby introduce a social issue—the Jewish problem. There are two kinds of spectator catharsis; (a) individual and (b) collective.

The kind of session which deals with collective problems is called the *sociodrama*. It differs from a psychodramatic session in that the issues presented are of a collective nature, the general roles are lived and experienced in a collective way, and must be portrayed in a collective way. The primary concern of the director is the *group*. The roles which represent collective

ideas and experiences are called *sociodramatic roles* (*the father, the mother, the soldier, etc.*), those representing individual ideas and experiences, *psychodramatic roles* (*a mother, a father, a soldier, etc.*). But we know from experiments that these two forms of role-playing can never be truly separated. Whenever a subject has to portray the role of the husband in an individual and intimate sense, the sociodramatic role of the Jew (referring to the previous example) enters into the picture. Therefore the spectators of a psychodramatic session are affected simultaneously by two phenomena, a personal problem, for instance, a specific husband-wife problem, and an ethical problem, for instance, Jew-gentile. In sum, psychodrama has been defined as a deep-action method dealing with interpersonal relations and private ideologies, and sociodrama, as a deep-action method dealing with inter-group relations and collective ideologies.

Status Nascendi and Warming-up Process. In order for a subject to experience a spontaneous state in which he unfolds the deeper aspects of his personality, he must warm up and act in "statu nascendi." Warming up to these spontaneous states is aroused by various starters. The subject puts body and mind into motion, using body attitudes and mental images which lead to the attainment of the state. This is called the *warming-up process*. The warming-up process can be stimulated by bodily starters (complex physical process in which muscular contractions play a leading role), by mental starters (feelings and images in the subject which are often suggested by another person), and by psychochemical starters (artificial stimulation through alcohol, coffee, for instance). More specifically, the warming-up process making use of physical (body) starters can be seen in the subject who is thrown abruptly into a situation which is novel to him and to which he has to warm up in order to make a rapid adjustment. The study of the somatic reactions to role-taking in "statu nascendi" is called *physiodrama*. There are different degrees of warming up, from a minimum to a maximum, as is exemplified particularly in the patient's gradual approach to the third level of the stage, even though he may warm up quickly and jump immediately to the third level, he may fall far short of reaching his highest degree of warming up when actually there.

Role Theory. Role can be defined as a unit of synthetic experience into which private, social, and cultural elements have merged. It is an interpersonal experience and needs two or more individuals to be actualized. Role definitions which reduce the bearer to one individual are inaccurate. Role definitions which reduce the role-taking process to conditioned responses are a neglect of the importance of the varying intensities of the warming-up process and the degree of spontaneity reached in interpersonal stimulation. The relative unpredictability of the kind of role or the form it will take is due to the *s* factor (spontaneity), which the individual puts forth in a novel situation. Certain role capacities and levels of expression may have been reached by the individual beyond what he ever knew he possessed.

The individual is engaged in the process of role-taking from the moment of birth on, particularly in the roles of the eater and sleeper. We refer to such roles as *psychosomatic* roles. Later on, the child functions in the roles of brother or sister, playmate, daughter or son, etc. These are called *social* roles and function according to cultural standards transmitted through the adult world. *Psychodramatic* roles are often unrealized roles which the individual himself chooses to function in—for example, the role of God or the devil, the role of Santa Claus, or, a boy playing the role of a girl, a little girl playing the role of her mother, etc.

Individuals are tested and trained to determine their range and adequacy of roles, as to whether they are, in role-taking, weak or strong, dominant or recessive, flexible or rigid, slow, fast or overheated. These role characteristics often fluctuate in accord with the role-expectancy of an individual. An auxiliary ego or subject may expect of his partner before entering a psychodramatic scene characteristic role functioning. If this does not meet his expectations, his own role is affected, and any of the above characteristics may then manifest themselves.

Just as we find patterns of acceptance and rejection in interpersonal structures, we are likewise able to find inter-role patterns in which role acceptance and rejection occur. This has been intensively studied in the treatment of marriage problems via psychodrama. The treatment of isolated members in a typical "eternal triangle" in a marriage problem can often re-

sult in wrong solutions, very often left to the discretion of the psychiatrist. However, by treating the problem as an interpersonal unit, placing its members on the stage in *typical* marital scenes, we see the inter-role *patterns* emerging as the drama proceeds. It is only during the psychodramatic work that we can study how they take form spontaneously. These inter-role relations are discoveries for the subjects themselves and throw an entirely new light upon understanding their marital difficulties. They discover that there are more roles functioning incompatibly or unfulfilled than those of husband and wife, such as the role of lover, artist-adventurer, career man or woman, etc. They discover further that roles are interdependent, that of deficiency in one role may cause another to be more adequate, or that the psychodramatic training of a deficient role for adequacy may strengthen other roles.

Spontaneity Theory. The backbone, so to speak, of psychodramatic theory is the spontaneity factor. To warm up to a spontaneous state on the spur of the moment in creating or in unfolding the deeper levels of the psyche is a desired achievement in a psychodramatic scene. Spontaneity, broadly considered, is a resourcefulness which integrates, on the spur of the moment, the faculties of the personality to meet a situation. It may be an old situation to which he responds anew or it may be a novel situation. Individuals show various degrees of spontaneity by their variety of responses to a new situation. Studies so far show little or no correlation between spontaneity and intelligence.

It is assumed that the spontaneity factor operates with great intensity and frequency during infancy before intelligence and memory have a chance to predominate. The infant is faced continuously with startling and difficult problems to which he must make a rapid adjustment. Gradually the spontaneous responses become conserved, and as the child grows older, they become a part of memory and intelligence. Memory and intelligence begin to predominate in using conserved patterns as responses to situations and the *s* factor becomes the forgotten function. Spontaneity training is already being used in schools and corrective institutions as a part of educational procedures to encourage the child to continue his spontaneous expressions, to retain them as experiences (not conserves)

to be organized into new responses, which are appropriate for a new situation. He must be trained to develop a plastic adaptation skill, a mobility and flexibility of the self, which is indispensable to a rapidly growing organism, especially in a rapidly changing environment.

Just as we find individuals in need of training because of a low spontaneity factor, we likewise find individuals who have an overflow of spontaneity and a set of conserved patterns which do not click with it. This unbalanced spontaneity is unable to organize conserved patterns into new creative responses. This is observable very often in musicians or actors who find their mediums of expression, the violin or the script of the playwright, a hindrance and a foreign body to their surging feelings of creativity. Often a performance neurosis is the result. A striking example is that of a musician who trembled when playing his violin in a large symphony orchestra. In order to re-educate such people we return them to wild spontaneous expression as a starting point. While on the psychodramatic stage, he was told to try to relax and play his violin without any consideration of musical conserves, freeing himself as much as possible from tensions and images. It was an unorganized chaotic playing. Gradually resistances were introduced such as themes as suggested by the instructor, then, moods of pity and sympathy, so that the feeling of the music carried him; next, he was to give musical interpretations of pantomimes and plays. In this way, he learned gradually to adjust his playing to moods and feelings of other people. As these performances of the people were unpredictable he had to make spontaneous responses to their changes in movements and moods. Here his spontaneity began to become disciplined and orderly. As these resistances continued, he finally reached the point of incorporating the resistances of the musical score now that his feeling of another's creation could envelop him, and now that he had acquired sufficient flexibility in integrating these two factors into his own creative interpretation.

Psychodrama in Relation to Other Diagnostic and Therapeutic Methods. Psychodrama is a deep-action method which differs from psychoanalysis and such projective methods as Rorschach, finger-painting, free association tests, etc., in that it not only explores the same ex-

pressions of personality, but, in addition, the personality in movement and action, and in its social relations. Second, the results from such tests would be far more revealing if a one-way relation of subject and observer in interview methods were to be replaced by the two-way relationship of subject and participant observer functioning as an auxiliary ego in different roles. The therapist views himself as a personality interacting with that of his subject. He takes not only the limited role of the therapist, psychiatrist, or social interviewer. Third, the verbal report methods frustrate a warming up to a maximum spontaneity state due to the restraint of action in space which affords the use of physical starters, i.e., walking, rising or sitting, gestures of hands and arms, etc., in order to warm up to deeper levels of personality expression. In sum, we may say that psychodrama brings the projective reflections into realization through activity. Furthermore, psychodrama appears to be merging the methods of behaviorists and that of the introspectionists by allowing the experiencing and reacting organism to verbalize and *activate* his imaginal content.

Indications and Counterindications. Psychodramatic procedures are especially indicated in minor maladjustments and social conflicts as in family, matrimonial, and employment situations, because of its ideal combination of individual action treatment with group psychotherapy. This explains its low cost, since therapy can be given to large groups of individuals simultaneously.

However, although it is a therapeutic instrument of high flexibility, adaptable to practically every situation, its direction requires high professional skill. Obviously, under unskilled direction, psychodramatic procedures can be harmful to individuals and groups just as the indiscriminate use of a drug. It is especially indicated that in the acute phases of a psychosis; for instance, in the case of a subject who contemplates suicide, there may be an over-stimulation on the stage which may cause him to mobilize all his mental resources towards an act of self-destruction.

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PSYCHOLOGICAL CORPORATION, THE.—This is a business organization for the advancement of psychology and the promotion of its useful applications. Its main office is located in New York City, where a staff of psychologists and assistants is maintained. As of 1944, over one hundred persons were employed in this office, and some two hundred psychologists throughout the country cooperated as research associates in the various services rendered by the corporation.

SERVICES

The corporation's staff has developed and now operates the following services, each handled by a semi-autonomous division:

Marketing and Social Research Division. Conducts consumer surveys in cooperation with psychologists throughout the country. Deals with problems in the fields of selling, advertising and public opinion. Makes continuous studies of trends in buying behavior and public opinion based on ten thousand interviews every three months, known as The Psychological Barometers, established in 1932-33.

Industrial Division. Renders consulting services on employee selection and upgrading procedures and development of supervisory personnel. Installs employment tests and trains company interviewers and test administrators. Interviews, tests and renders comprehensive reports to companies on men being considered

for sales and executive positions, or for other specialized lines of work.

Test Division. Serves as a publishing, sales, advisory and research agency for psychological tests and materials. Issues annual catalog of representative tests, and bulletins from time to time describing new developments. Conducts research for construction and standardization of new tests and the improvement of present forms.

Testing Service Division for Schools of Nursing. Tests applicants for admission to schools of nursing throughout the country, with the cooperation of local psychologists and qualified test administrators. Conducts continuous research on tests and student selection procedures.

The Psychological Service Center—Clinical Division. Provides aptitude testing and practical psychological counsel on educational, vocational and personal problems of adults and children. Conducts testing programs, studies of individual pupils and other psychological work for schools and institutions.

HISTORY

The corporation was organized in 1921 by Dr. James McKeen Cattell and a group of forward-looking psychologists. It was established as a business corporation, but not for the individual profit of the incorporators, stockholders, or directors, beyond reasonable compensation for services rendered. The idea of the founders was that the economic value of psychological work could be capitalized for the benefit of the science, and hence the corporation is committed to utilize a share of its profits to promote the advancement of psychology by research, the more effective organization of psychological work, and the diffusion of knowledge concerning psychology. For the first ten years of its existence, the financial results of its operations were not very promising, but since 1930, when steps were taken to organize and build up a competent staff, its earnings have steadily improved, and in 1944 its gross income from the operation of its various services was over \$700,000. About 20 per cent of this income, however, was derived from the operation of a temporary War Research Division executing contracts with the U. S. Federal Government's Office of Scientific Research and Development.

The board of directors of the corporation, twenty in number, has consistently comprised

recognized leaders in psychology, and the presidents of the corporation have been, successively, James McKeen Cattell, Walter V. Bingham, R. S. Woodworth, E. L. Thorndike, A. T. Poffenberger, Walter R. Miles and Paul S. Achilles.

The capital with which the corporation started business was \$10,000, raised by issuing one thousand shares of stock at no par value which were originally sold to psychologists at ten dollars per share. Dr. James McKeen Cattell maintained the controlling interest by retention of six hundred shares of stock, the balance being purchased in small lots by some two hundred other psychologists. In November, 1942, Dr. Cattell, by gift of his six hundred shares of stock, established the James McKeen Cattell Fund for scientific research and the dissemination of knowledge, with the object of obtaining results beneficial to the development of the science of psychology and to the advancement of the useful application of psychology. As of 1945, the trustees of this fund were A. T. Poffenberger, secretary-treasurer; Paul S. Achilles, managing trustee; Elsie Oschrin Bregman, Henry C. Link and Dean R. Brimhall, trustees.

RESEARCH

In addition to the advancement of psychology by the rendering of services of economic value, the corporation seeks to advance psychology by research. To a large extent, the services rendered to its clients are of a research nature, but it also conducts research to improve its own services and tests, or other materials which it offers for sale. Insofar as its funds permit, it seeks also to conduct, or to aid in the financing of, pure research. For several years it made grants in aid of research to graduate students and other psychologists, but subsequent to the establishment of the Cattell Fund, this practice was discontinued and a standing research committee of the board of directors now considers jointly with the staff such research as may be undertaken by the corporation itself, or by others with the aid of financing from the corporation.

PAUL S. ACHILLES,
Psychological Corporation

PSYCHONEUROSES.—Anyone who undertakes a systematic discussion of the psychoneuroses at the present time faces the

difficult problem of establishing the general nature of the reaction type which would be sufficiently broad to cover the vast number of heterogeneous clinical manifestations that are usually placed in this group. This problem presented less difficulties when Dubois (1) first introduced the term. The group of disturbances which were discussed by him was comparatively small, and little was known about their internal complexity. But the progress that has been made since then, particularly in regard to the nature of these conditions and their etiology, has resulted in a gradually increasing complexity and a vast extension of the scope of this field. To the physician these discoveries have opened up new avenues of approach to clinical problems that have not hitherto been considered as belonging to the psychoneuroses. On the one hand it brought into this group a number of previously unrelated psychiatric conditions, in which more adequate methods of psychological analysis demonstrated mechanisms similar to those found in the psychoneuroses. On the other hand we gradually came to appreciate the fact that a large number of diseases which were hitherto considered as being of purely somatic origin could develop on the basis of personality problems and therefore both etiologically and therapeutically belonged to the field of the psychoneuroses. As a result the psychoneuroses have assumed a new and much broader role in the medical profession not only because of their wide prevalence but also because they have come to represent a link between the so-called psychic and somatic illnesses.

A further broadening of the scope of the psychoneuroses took place with the extension of the concept into fields outside of medicine. The contributions made by Freud and his followers in regard to the dynamics of psychoneurotic symptom formation have been found to be applicable to the studies of normal psychological phenomena, particularly to such aberrations from average behavior as crime and delinquency. Furthermore, attempts have even been made to apply these mechanisms to phenomena of group behavior and social pathological processes, thus introducing the somewhat questionable, even if popular, concepts of group neuroses.

All of this has resulted in two phenomena. On the one hand it has increased the impor-

tance of the concept of psychoneurosis to a pronounced extent and has made it imperative for anyone who attempts the study of medicine, psychology, or sociology to get a thorough grasp of the nature of these disturbances. On the other hand, with the increase of the variety of conditions included under this general term its limitation from other conditions has been rendered more obscure and it has loosened the degree of cohesion of the syndromes included within the group. Within the last few years, and particularly from developments during World War II, quite a few workers in the field have begun to doubt the value of continuing the term "psychoneurosis" as applicable to all the syndromes which it is supposed to include. Obviously, if we are going to discuss the field of psychoneurosis it is rather important to determine whether it still may be regarded as a practically useful term and, if so, to what particular conditions should it be applied.

This point is not of didactic importance alone. When Dubois first suggested the use of the term, he stressed the point that it should be applied to disturbances which are predominantly psychologically conditioned and which are, therefore, most likely to be helped by psychotherapy. As we follow the subsequent developments we find that the extension of its scope was primarily caused by the fact that psychotherapy could be successfully applied to a progressively increasing number of disturbances because of the discovery of their psychogenic etiology. From a practical point of view this is the most fundamental reason for maintaining the term and applying it to the syndromes which are included in it. In this sense it is actually of little importance whether all of these syndromes necessarily show similar clinical pictures, present similar prognoses, or are of similar degrees of severity. The question, therefore, that we wish to deal with here is whether there still exists a certain group of syndromes which, no matter what variations they may manifest in their clinical pictures and prognoses, show enough of similarity in their etiology and therapeutic indications as to be justifiably included under this one group.

Let us start out with a discussion of the type of disturbance that is diagnosed as psychoneurosis and see what the characteristic features of such a condition would be and to what syndromes it can be justifiably applied. For this

purpose we wish to present the following sample cases.

The first case is that of a 28-year-old married, white, American-born male who has recently been discharged from the armed forces with a diagnosis of psychoneurosis and had been referred from his place of employment with the following complaints: He has recurrent attacks of nausea, vomiting and diarrhea; occasionally develops pains and swelling of the hands and feet, and suffers from easy irritability and inability to concentrate on his work. He was born in a small Midwestern community. The family history shows high incidence of personality maladjustments, such as chronic "nervousness," restlessness, roving personality types, frequent unexplainable physical ailments, especially arthritic and genito-urinary disturbances, and mild depressions. The father and mother were poorly mated, and six months after the birth of the patient, who was the only child, they were divorced. The patient was adopted by his mother's married sister and did not know his true relationship to his real mother until after her death, when he was 23 years old. He lived with his adopted parents until the age of 13, at which time he had completed grammar school. At that time his adopted father died, presumably from a stomach ailment, and he went to live with another one of his mother's sisters, with whom he spent the next four years. Whereas the first home was a comparatively satisfactory one, the second one was characterized by lack of interest and affection, strict discipline, and economically poor status. During the latter period his life was made particularly unpleasant by two unmarried aunts whom he describes as hypercritical, domineering and frustrating every attempt on his part to undertake anything on his own initiative. From the beginning he seems to have been a very sensitive, introspective boy, given to self-observation and worry about his physical condition. The combination of domineering and protectiveness by his relatives resulted in a paradoxical attitude towards responsibility. On the one hand he revolted vigorously against discipline and criticism, particularly by women, and on the other hand he developed over-dependence upon others and an inability to make decisions on his own initiative. The one person in his family who showed him any affection and interest was his maternal grandmother, with whom he had periodic con-

tacts and to whom he was very much attached. He was of high average intelligence and graduated from college, majoring in journalism. His graduation came at about the time of the introduction of the Selective Service Act and he enlisted in the Army, being assigned to the Aviation Corps in a clerical capacity. Aside from the high degree of sensitivity and occasional hypochondriacal worries about his physical condition he had shown no symptoms prior to induction, with the exception of one incident. This came shortly before induction, one week after his mother's death. As was stated above, he did not know his true relationship to her and considered her as one of his aunts. She became ill with an obscure abdominal disease and at the same time his grandmother developed a severe case of arthritis. One week after his mother's death and directly after having been informed of the fact that she was his mother he developed swellings and pains in the joints of the hands and fingers. No organic reasons were found for this condition and he recovered from it spontaneously.

His experiences in the military service were quite varied. He joined as a private and later was promoted to the rank of corporal and was placed in charge of activities in which he had to direct a number of men under him. It was at this time too that he first met his future wife and her family. Unfortunately this family was quite clearly dominated by the girl's mother and her oldest sister, both of whom reminded him of his early contacts with his aunts, and he immediately developed an intense dislike to them. Apparently as a result of this, as well as the responsibilities of his work, he developed his first attack of gastro-intestinal trouble from which he recovered without any specific treatment and following that was sent overseas. His work overseas consisted of a number of dangerous missions in association with Intelligence activities. There, too, after having been promoted to the rank of sergeant and placed in charge of a detachment which had to do with serious liaison functions between various fighting units, he developed a second attack of gastro-intestinal disturbance. His performance in his duties was apparently quite satisfactory and because of his educational background and his abilities he was recommended for officer's training and was sent back to this country for that purpose. He received a course of training,

at the end of which three rather important occurrences took place in his life. Upon completion of his training he was commissioned a lieutenant in the Army and placed in charge of important Intelligence work. Shortly before that, he was called back to his home town because of the serious illness that his grandmother developed and which culminated in her death. At the same time he became engaged and subsequently married his present wife. His appointment to the rank of lieutenant took place after these two incidents and he had asked and received a three-day furlough to go to see his wife. On the way there he became ill on the train with an acute gastro-intestinal upset, collapsed, and had to be taken off and sent to a hospital. His condition was considered at first as being of organic nature, but a series of investigations failed to show any organic cause, and after a number of months, during which he had repeated attacks of the same condition, he was discharged from the Army with the diagnosis of gastric psychoneurosis.

His first attempt at rehabilitation was to apply for a position in which he could resume his journalistic work which was interrupted by the war. He was accepted on the staff of a large newspaper, but the work to which he was assigned consisted of cutting out clippings, a task which was far from being interesting. At the same time the wife's mother and sister were becoming progressively more difficult to get along with. Their constant criticisms and nagging led to severe quarrels and interfered with his attempts to adjust to an already unpleasant job. He finally decided to move to a small Midwestern town where he obtained a position which was more in keeping with his interests. The few months that he spent there were quite satisfactory and symptom-free. The wife, however, wanted to get back to her own home and finally succeeded in talking the patient into it. The return to the wife's home brought with it a renewal of the quarrels with his in-laws and to this was added the fact that he had to accept work which was neither interesting nor very highly remunerative. As a result the symptoms reappeared, he gradually became worse and was finally referred to our clinic. The treatment consisted in an analysis of his early experiences, the problems under which he was laboring, and the relationship between the development of his symptoms and these problems. Concom-

itant with that, the social setting was changed. He was aided in getting a new position and in moving out of his mother-in-law's home. At present the patient is symptom-free and is adjusting quite satisfactorily at his work.

The story of this patient and the development of his symptoms follows a fairly characteristic pattern. A special constitutional background and early environment have resulted in the development of a personality characterized by sensitivity and unusual interest in one's bodily functions. Added to this was a constellation of conditioning factors which made it difficult for him to adjust himself to the acceptance of adult responsibilities. Finally, a series of incidents in which there has been a re-enactment of the early conditioning influences facilitated the development of his symptoms. Furthermore, the symptom picture was characterized by somatic ailments for which no obvious organic cause could be found, as well as a general state of irritability and lack of ability to concentrate. In addition to these it was noted that his personality functions in general were not affected. He showed no involvement of his intellectual functions, there were no profound affect disturbances and no evidence of projections. This case serves as an example of a large number of similar conditions which, although they are encountered in civilian life, were particularly frequent in the military psychoneurotic casualties. They are sometimes referred to as psychosomatic disturbances, at other times as organ neuroses, but are conventionally placed into the group of the psychoneuroses. In the same group, however, we have been traditionally placing other forms of personality disturbances which superficially seem quite different from this one.

An example of one of these is the case of a man of 30 who, following a minor automobile collision, developed complete blindness without any signs of organic disturbance. His history showed a series of early experiences which conditioned unconscious fear of marital responsibilities. Sometime before the development of the symptom, he married and shortly thereafter the wife became pregnant. It was on his way to the hospital, where the wife had just been delivered of a baby, that the collision took place which resulted in blindness. An analysis of the case brought out the fact that the patient unconsciously used this symptom as a way out of meeting the responsibilities of marriage

which he dreaded because of his early experiences. The development of the condition is similar to that in the case described above, although the clinical picture is definitely different in that no actual organic pathology was found either as a cause or effect of the disturbance. We usually refer to this type of symptom complex as conversion hysteria and it is classified under the group of the psychoneuroses.

Finally, a third case showed a series of obsessive compulsive reactions in a girl of 24, who for years has been tormented by fears of contamination and handwashing compulsions. We found that the family history showed a number of cases of poorly adjusted personalities of the obsessive-compulsive types and she herself has always been of a rigid and ruminative nature. Early in life a series of sexual experiences took place, accompanied by feelings of guilt and fears of discovery and pregnancy. An attempt in early adolescence to establish heterosexual contacts resulted in an accentuation of the old fears and, given the personality type that was characteristic of her, she took flight into the fantasies of contamination and the resulting compulsive activities. This form of disturbance is usually designated as psychoasthenia, another subgroup of the psychoneuroses.

As we reach out further into the field of disturbances conventionally classified under this heading and consider such conditions as the chronic states of fatigue, acute anxiety syndromes, the diffusely complaintive hypochondriases, the phobias, convulsions, amnesias, and so on, we see how immense the variation in the clinical picture and in the severity of the disturbance can be. It is easy to see why serious doubts have been expressed as to the advisability of including all of these syndromes under a single group and if the clinical picture alone were considered it would be difficult to see of what practical use this would be. All of these syndromes, however, show some very distinct and fundamental similarities. Perhaps the most obvious, even if most superficial, of these is that to most people the term "psychoneurosis" denotes symptoms for which no obvious reasons can be discerned. Whether these are headaches or gastro-intestinal disturbances, phobias or amnesia, one fails to see on the surface any organic or conscious psychological reasons why the person should have such symptoms. Another feature that they have in common is that the

symptoms seem to serve some purpose. In other words, they serve as a sort of social barter used by the person to obtain a solution to a problem which he otherwise cannot solve. If we go more deeply into the nature and manner of development of these disturbances we find further that in most of these cases we are dealing with individuals who, even before the onset of the symptoms, have shown certain characteristic personality traits which they may have inherited or acquired very early in life, but in either case they have been consistently peculiar to this person throughout his life. More important than this, however, and actually to be considered as the deciding factor in the development of the symptoms, is a series of conditioning experiences occurring during the formative years of life, which on the one hand lead towards the establishment of a conflict in the process of adjustment to important instinctive function and, on the other, set a pattern for the symptom complex which the patient uses as a substitute solution of the problem. Finally, we see that the onset of the symptoms occurs in reaction to a situation, the stress factors of which are specifically related to the patient's individual vulnerability. It is true that as we analyze different cases we find wide variations in all three of the above-mentioned causative factors. In all of them, however, the one feature that stands out as most characteristic is the fact that the symptoms develop in relationship to socio-psychological entanglements, the correction of which removes the need for symptom formation. It is because of this fundamental aspect of the psychoneuroses that the development of psychotherapy is so intimately associated with the history of these disturbances. The appreciation of this relationship was basic to the original concept of Dubois, it forms the central core of the analytic approach to the neuroses, and finally it is the main practical reason for the development of the field of psychosomatics. The guiding principle in all of these is the idea that since these symptoms are of psychological origin they can be treated psychotherapeutically.

From a practical point of view it is, therefore, important first of all to gain an insight into the manner of development of these disturbances and thus secure a foundation for therapeutic procedures. Then we must learn something about the various types of clinical manifestations we are likely to encounter in this field, and

finally, we will have to acquaint ourselves with the methods of differentiating the psychoneuroses from other types of personality disturbances. It is proposed to take up these three problems in the following paragraphs.

ETIOLOGY

It is obvious that within the limits of the present contribution the vast amount of data that have been accumulated, particularly within recent years, in regard to the manner of development of the psychoneuroses, cannot be exhaustively treated and we must refer the reader to more detailed exposition of the subject for further information. From what has been said above we can see that three factors seem to combine in producing these syndromes: the constitutional, the developmental, and the situational, although in different cases one or another of these factors may have predominance.

Constitutional Factors. Perhaps the least well defined of the three are the constitutional factors. It is obvious that personality characteristics do not lend themselves easily to investigations along genetic lines. It is true that in most of these cases we find that the family history usually shows a higher than average incidence of personality characteristics frequently closely related to the types manifested in the patients themselves and which may render them predisposed towards the development of psychoneurosis. Also, it can be noted that the well-known constitutional types, as for instance, those which have been described by Kretschmer and more recently by Sheldon (2), and which are presumed to have an hereditary basis, are frequently encountered in this group. Thus we find the introverted, hair-splitting, scrupulous, pedantic personality type, more likely than not of the leptosome physical make-up as the soil on which the obsessive-compulsive syndrome will develop. Similarly, the histrionic, sentimentally demonstrative extraverted person is frequently the one who develops hysteria. Finally, the various psychosomatic disturbances also seem to develop most frequently in certain types of personality make-up. All of which would suggest an hereditary background at least as a determinant of vulnerability. At the same time we find in the histories of these patients certain personality characteristics which facilitate the development of the disturbance and

which have been manifest before the onset. Whether this is entirely on the basis of genetic factors or whether it may develop because of environmental influence during the most formative years of life remains a question. We may regard all of these factors as constitutional, if we mean by constitution a combination of factors that have been inherited and those which have been acquired so early in life that they have become part of the personality and cannot be manipulated by the environment. Furthermore, we can say that although it is not absolutely essential that such a set of constitutional factors must be present in every case of psychoneurosis, nevertheless the development of a psychoneurosis is facilitated by the presence of such a personality.

Developmental Factors. In the histories of the three patients described in the introduction it was noted that certain experiences in the early years of the patients' lives had exerted an important effect on their subsequent behavior and particularly on the development of the symptoms. It is generally agreed that this is true of symptom formation in psychoneuroses as a group and since such experiences take place during the growth of the person they can be designated as developmental factors. They may affect personality functions in either one of two ways. In the first place the child may take on certain general characteristics that are peculiar to the persons in his immediate environment. This may be accomplished by purposeful imitation, by unconscious identification, through conditioning and other processes of this type. A certain number of these characteristics may become so firmly fixed as to be rendered permanent personality traits. In view of what was said in the preceding discussion of constitutional factors, it is obvious that such personality traits cannot be easily, if at all, differentiated from hereditary characteristics, nor is it particularly important to do so. We must, however, appreciate that their influence is primarily of a predisposing nature, in that they may make the individual susceptible or vulnerable and thus provide suitable soil for the development of psychoneuroses. It is obvious that those characteristics which develop earliest will tend to be most firmly fixed and are, therefore, more closely related to the constitutional factors, whereas the ones that are acquired at a later stage are likely to be less permanent, more

easily manipulated by re-education and therefore more amenable to treatment. These latter could be regarded as developmental in nature. Whichever of the two phases we are dealing with, the important thing is that they represent primarily potentialities and not specific etiological factors.

As contrasted with these we find in the cases presented above, as well as in most patients suffering from psychoneuroses, certain experiences occurring during the development of the person which may affect them in such a way as to lay the foundation of the future psychoneurotic disturbance and even determine the type of symptom complex which develops in reaction to stress situations. These experiences must be regarded as specific in nature and they are the ones that are usually dealt with in the process of psychotherapy. Generally speaking, it may be said that traumatic experiences of this second type occur most frequently in relationship to two important developmental processes, namely: (1) the organization of the instinctive life, and (2) the establishment of conditioned reflexes.

(1) The first of these refers to the process of integration whereby the vital biological needs, such as self-preservation and sex, are organized during the growth of the individual in relationship to each other, to the outside world, and to the developmental changes that take place in both. There are three conditions which make it particularly likely that traumatic experiences of considerable importance would occur in this process. In the first place, it is obvious that since these biological needs are expressive of different types of function they will also differ in their objectives. Whenever these objectives are actually opposed to one another we may find the person being impelled in opposite directions at the same time. A conflict will thus occur and if the two forces do not succeed in neutralizing each other completely, the result will be a gratification of one instinctive need and repression of the other. But repression naturally leaves a potential need for gratification and, therefore, a continuing search for an outlet, until such gratification has in one way or another been attained. Secondly, it must be realized that even if the objectives of all of these instinctive needs coincide they may be opposed to the interests of the outside world and thus lead to a conflict with it. This situation is

further complicated by the fact that the need of adjusting to the outside world may be conditioned by what we expect in return in terms of security, approval, recognition, and so on. A conflict may thus be established between the internal instinctive needs and the dictates of organized environment, and here, too, the result will be repression with consequent search for an outlet. Finally we must remember that the individual, during his development, undergoes a process of maturation during which the methods of reaching the objectives of the instinctive needs, or the objectives themselves, may change. This is especially well demonstrated in the case of the sexual drive where throughout the formative years of life and until the adult heterosexual stage is reached, the person shifts successively from one method of gratification to another. During any one of these stages the pattern of gratification becomes more or less firmly entrenched, and when, because of physiological and socio-psychological development, the old method has to be replaced by a new one, a conflict will ensue in the process of emancipation from immature patterns of behavior. The result here too will be repression and subsequent search for outlets.

We see, therefore, that the process of organization of the biological needs in all of its phases is likely to give rise to repression and search for outlets. In the average person these outlets are provided by incorporations of early needs into new methods of gratification, substitutions, and compensations which do not interfere too seriously with adjustment. Where for one reason or another this is not accomplished, either because the repression is too strong or too permanent, or another outlet is not available, then pathological forms of gratification of such needs must be developed and these manifest themselves as symptoms of personality disturbances. These symptoms may be the direct outcome of such repressions in terms of tensions, anxieties, or withdrawal from contacts with the outside world. If the person has not succeeded in emancipating himself from earlier levels of adjustment, symptoms such as feelings of guilt and fear of punishment may result. Finally, they may lead to the development of pathological substitutions or compensations in the form of conversions, compulsive phenomena, etc.

(2) The investigations that have been re-

ported in the field of conditioned reflexes, both in normal behaviors and in the production of experimental neuroses, have demonstrated the fact that psychoneurotic symptoms may also develop on the basis of either accidental or purposeful combinations of indifferent stimuli with those that are specific to biological functions. In the first place, it has been shown that if certain primary biological activities are accompanied by experiences which are not specifically related to them, these combinations may lead to the establishment of conditioned patterns of behavior. Thus it is easy to see how the ingestion of certain foods may become combined with feelings of fear, disgust, or even symptoms of physical distress. Similarly sexual experiences may be combined with feelings of guilt, fear of punishment and general anxiety. In the second place, since the organization of instinctive needs, particularly in their relationship to social behavior, is very largely dependent upon conditioning, situations may develop in which the performance of these functions may become too complicated and difficult of achievement and thus lead to states of anxiety and tension. Actually most of the experimental neuroses produced in animals develop on this basis. Investigations of patients with psychoneurotic disturbances show that this mechanism frequently forms the basis of psychoneuroses in man also.

What was said above in regard to these developmental factors obviously represents only a very sketchy and incomplete account. A great many investigations have been undertaken and reported in this field in relationship to the two processes mentioned above as well as other important phases of development. For further information on this subject the reader is referred to the literature on psychoanalysis⁽³⁾, conditioned reflexes⁽⁴⁾, experimental neuroses⁽⁵⁾, and other contributions to dynamic psychology and psychopathology.

Situational Factors. The process of adjustment to any new setting depends upon two sets of determinants: the person as he is at the time, and the situation which he has to meet. The first of these is determined by the person's constitutional characteristics as they were modified by his developmental experiences. The second consists of the situation itself and whatever stress factors may be included in it. The extent to which these latter determine behavior

in general, and psychoneurotic behavior in particular, is what we would designate as situational factors. It is obvious that the number and variety of all possible situational determinants is in fact infinite in its scope. For systematic purposes, however, we may consider these as consisting of the following categories:

1. *Social Factors.* The human being is a social organism depending upon society not only for protection, approval, and recognition that he gets from it, but also for what he can, and desires to, give to society. In a dynamic system as society is, we must naturally expect a good deal of fluidity, with resulting changes that demand a continuous change in adjustment. Under ordinary circumstances these changes, however, are not great enough to place too much stress on the individual. But where a more drastic change takes place, the individual is called upon to undertake more radical changes within himself, and if he has been rendered vulnerable either by constitution or by traumatic experiences, a failure in adjustment may occur. Whether these changes are of a general nature as are encountered in such social upheavals as war, revolution, mass panics, etc., or whether they are more localized either to the group in which the individual lives or even to his own narrow family circle, the result will be the same, in that, depending upon the intensity of the situational stress and the vulnerability of the person, a specific break in adjustment may take place.

2. *Economic Factors.* In a society where status and security are mainly dependent upon the economic setting of the individual himself or the group in which he lives, it is quite understandable that drastic economic changes may precipitate personality maladjustment. Country-wide depressions and economic class struggles, or personal difficulties with loss of savings or of a job may, depending upon the personality of the individual, lead to psychoneurotic symptom formations.

3. *Personal Factors.* Throughout the life of each person, changes in his own personal organization occur by virtue of the fact that he is a dynamic, biological system. The infant, if he lives, is bound to develop into the child, the child into the adolescent. The adolescent matures and has to take on new responsibilities. The mature person goes through a period of productive life and then involution sets in with

the subsequent development of senility. Although the process of development is a continuous one, nevertheless certain periods of life are characterized by especially radical changes. Puberty, marriage, the menopause in women and, perhaps, climacterium in men, all occur more or less abruptly. Each one of these points may be regarded as a critical stage at which adjustment will be rendered particularly difficult. Here again, given a certain type of constitution and specific developmental experiences, the ability to adjust may be strained to a breaking point, especially if the person is not prepared to make the transition.

4. *Organic Factors.* Finally we must take into account the importance of organic factors as possible situational determinants of maladjustment. Acute febrile diseases or chronic debilitating ones, injuries, especially such that are disfiguring and crippling, may be difficult to adjust to, particularly if the person has been made vulnerable to such stress by earlier factors. Toxic agents, exhaustion, deficiencies in nutrition also are known to act as stress agents which may precipitate the development of personality disturbances. It is true that in the psychoneuroses we do not regard organic etiologies as being of primary importance, but they can and do frequently act as contributory factors in the sense of precipitating causes. Here we might also mention the fact that organic factors can act in an indirect manner. By this we mean that even if the person has been able to adjust himself to the acute effects of, let us say, infantile paralysis and come through with a normal adjustment to these, the resultant sequelae such as crippling and atrophies, particularly if they happen early in life, may in themselves create constant sources of feelings of inferiority and inadequacy and thus lead to the development of compensatory mechanisms.

CLINICAL MANIFESTATIONS (6)

In the introduction it was emphasized that at the present time the number and variety of clinical syndromes that are placed in the group of the psychoneuroses is so immense that it has actually become questionable whether they can all be regarded as belonging to one nosological entity. In clinical practice we find that these countless cases are at such variance with one another that each one represents a new phenomenon in itself. Nevertheless in an arbitrary

way we can divide the whole field into several broadly conceived groups of symptom complexes and these are as follows:

1. *Conversion Symptoms*. The second case that was quoted above of the man who developed blindness in reaction to a conflict situation represents a typical example of what is known as conversion symptom. We mean by it that the individual develops a symptom, usually somatic, which does not have, as far as anybody can see, etiologically relevant organic pathology. Furthermore, this symptom seems to help the individual to deal with a dilemma which he cannot otherwise meet. Reactions of this type are known as conversions. The variety of possible conversion symptoms is, of course, very great. Perhaps no system of the organisms is immune to the possibility of conversion symptoms. Most frequently we encounter the following types of symptoms: (a) *Motor*. Here we find paralyses of voluntary muscles such as the arms or legs, interference with the function of the bladder or gastro-intestinal tract, vomiting, paralysis of the vocal cords, tremors, etc. (b) *Sensory*. Here we find anesthetics or analgesias, pain or other unpleasant sensations and disturbances of the organs of special sense such as blindness, deafness, etc. (c) We may also find in this group mental symptoms that frequently are known to develop in organic disease of the nervous system such as amnesia and delirium. When conversion symptoms are the main features of the psychoneurosis the condition is classified under the syndrome of *Hysteria*.

2. *Anankastic Reactions* (7). This term was proposed by Schneider to designate symptoms which are characterized by compulsive features. They may occur in the form of thoughts, feelings, or acts, the pathological nature of which the patient realizes but is compelled to experience them and react to them even though he sees no good reason for doing so. They too, of course, develop in relationship to psychological mechanisms, the nature of which was discussed in the section on etiology. Three types of such symptoms may be described as follows: (a) *Obsessions*. These are anankastic thoughts that continually intrude themselves upon the person against his own will so to speak. The mother who is continually obsessed with the idea that she may kill her child; the religious person who is obsessed with thoughts of blasphemy and sacrilege; thoughts of suicide or self-mutila-

tion, and others like them may be encountered. In all of these the person may feel reasonably certain that he is not going to follow out the action itself but is continually tormented by these thoughts and is incapacitated in his other activities because of them. (b) *Phobias*. These may be defined as unwarranted fears: claustrophobia, agoraphobia, nyctophobia, astrophobia, aichmophobia, are examples of this type of symptom. The patient may realize, logically, that there is no basis for his fears but he is unable to force himself into the situation in which the symptom is centered. In that sense they may become completely incapacitated in their work and general adjustment. (c) *Compulsive Acts*. These are various ceremonial, ritual, or habitual activities which the person feels forced to undertake even though he realizes the lack of any good reason for doing so. Compulsive handwashing, the compulsion to touch things or to count cracks in the sidewalk are examples of this type of reaction. In some cases, for example, peculiar movements, tics, uttering of meaningless sounds, the symptoms do not have any obvious meaning in themselves but are symbols of deeper-lying psychological urges which in turn depend upon earlier traumatic experiences. These, too, may increase to such an intensity that they interfere with the activities of the individual to the point of real maladjustment. Psychoneuroses which are characterized predominantly by anankastic symptoms are classified as psychasthenias.

Both hysteria and psychasthenia are furthermore characterized by certain general attitudes. In the first, we usually find the dramatic, martyr-like exhibitionism with which the patient parades his symptoms for the benefit of the observer. In the second, we find a great deal of reticence, introversion and, frequently, depression. This difference in attitude is closely related to the types of personality in which these disturbances are most likely to develop and which were discussed under the section on constitutional factors.

Faulty Control of Emergency Measures. (8) It is a well known fact that human beings show characteristic psychobiological responses to emergency stress situations. In the case of vital danger, for instance, the subjective feeling of anxiety is accompanied by definite physiological changes such as rapid pulse, increased blood pressure, changes in blood sugar, etc. Simi-

larly we find that when muscular exertion reaches a degree which is above the limits of average endurance for a given individual the phenomenon of fatigue is produced which manifests itself in both the subjective feeling and related biochemical changes. From a practical point of view it is important to emphasize the fact that both of these serve useful purposes with regard to the stress situation. The phenomenon of anxiety facilitates quick muscle activity resulting in either fight or flight, fatigue leads to cessation of further exertion. Because of this we may regard them as emergency measures. Psychologically we can also recognize other forms of emergency measures such as feelings of inferiority in facing a task which is beyond one's capacities, feelings of guilt in facing a situation that may lead to clash with the group and others. It is obvious that under normal circumstances where these responses occur in the presence of actual emergencies, they are not only to be regarded as normal but as useful reactions. In pathological conditions, however, we may find emergency measures of this type developing in the absence of actual emergencies but on the basis of mechanisms peculiar to the psychoneuroses. The most characteristic examples of this type of reaction are found in the anxiety states and neurasthenia.

Anxiety States. Clinically these are characterized by attacks of unexplained but intense anxiety which can be best described as similar to the fear reaction that an average person experiences when facing vital danger, but differs from it in that no such danger is present and in most cases not even imagined to be present. The concomitant symptoms are also similar to those found in normal fear reactions; chills, a sense of pressure in the head and precordial regions, cold perspiration, palpitation of the heart, and frequently increased pressure. Added to these, we may find such symptoms as alternating constipation and diarrhea, dizziness and even vertigo. At times we find these reactions occurring in relationship to anticipation of possible danger or following exposure to dangerous experiences, but where no actual danger exists. In most cases, however, such states develop without any reference to actual danger but where unconscious conflicts dependent upon past experiences may be brought to the surface by certain situational factors which in themselves need not be indicative of danger. In most

cases the condition manifests itself in acute attacks with intervening periods during which the person is quite well. In other cases it may gradually develop into a state of chronic anxiety, lasting for a long period of time without any intermissions.

Neurasthenia. Clinically this condition is characterized by feelings of physical and mental inadequacy, complaints of fatigue without adequate exertion, parasthesias, and a sense of general weakness. With this there may be an accompanying increase of irritability, lack of ability to concentrate, sexual impotence and, at times, a vague sense of anxiety. These conditions are usually of a chronic nature and in contradistinction to the anxiety neuroses occur most frequently in people who have always been known as chronically nervous with morbid introspection.

Psychosomatic Disturbances. The present day concept of the nature and manner of development of these disturbances is primarily based upon two important observations. In the first place, we have the investigations of Cannon (9) and his followers which showed that strong emotional experiences can produce changes in physiological functions. Such effects could be especially well demonstrated in the cardiovascular system, the digestive organs, and the glands of internal secretion. In the second place, recent clinical observations have shown that certain somatic disturbances are subject to influence by changes in the emotional state of patients. Increased emotional stress leads to exacerbation, whereas decrease of the stress produces amelioration sometimes to the extent of complete disappearance of the symptoms. As a result of this work attempts have been made to investigate a number of these syndromes in order to further our knowledge of the underlying psychogenic mechanisms and to develop appropriate psychotherapeutic methods of treatment. Although the whole concept is of comparatively recent development, it has already spread in its scope to include a very large number of conditions which have hitherto been considered as of primarily somatic origin. Some systems of the body apparently are more frequently affected in this way than others. Amongst the most important are the following:

A. Gastro-Intestinal Disturbances. (10) A good example of this type of disturbance is afforded by the first case described in the in-

introduction. The patient experienced severe gastro-intestinal upsets in response to emotional stress situations. In studying this case we found that the early experiences of this individual have created a conflict situation in his adjustment to adult functions and responsibilities. At the same time it was noted that in his family there were instances of similar reactions, a fact which may be regarded as indicating either constitutional predisposition or the establishment of patterns of reaction on the basis of identification. The important fact in the case was that the discovery of the mechanisms whereby these disturbances were produced and the removal of noxious elements in the situation have led to a disappearance of the symptoms. Different types of gastro-intestinal symptoms, such as spastic colitis, mucous or even ulcerative colitis, syndromes akin to those of peptic ulcer, and others have been reported as developing on an essentially similar basis. It is interesting to note that although instances of this type are frequently found in civilian practice, they were observed in particularly great numbers amongst the members of the armed forces.

B. Cardio-Vascular Diseases. (11) The occurrence of hypertension in young people without signs of underlying organic etiology and the fact that emotional stimuli seem to have such a pronounced effect upon the cardio-vascular system has led to an investigation of the role played by psychological mechanisms in disturbances of this system. The results reported by a number of observers indicate that factors of this type are etiologically important. In addition it has been found that in cases of organically conditioned cardio-vascular changes, exaggerations of the symptoms can be produced by emotional stress and, therefore, must be taken into account in their treatment.

C. The Endocrine System. (12) A good deal of evidence is available of the close relationship that exists between various endocrine disturbances and personality problems. Even in normal people one finds close relationships of this type as is evidenced by the frequent occurrence of disturbances in menstruation, sexual activity, and adrenal functions on the basis of emotional stress situations. Reports are also available in the literature of the important role that is played by emotional factors in the development and course of diabetes as well as in disturbances of thyroid function. The occurrence of im-

tence and frigidity in some of the other types of psychoneuroses points in the same direction. On the whole it is obvious that endocrine disturbances can certainly be aggravated and perhaps even produced by mechanisms which were described in the section on the etiology of the psychoneuroses.

A number of other organ systems are similarly influenced. In the first case quoted in the introduction we found that the gastro-intestinal systems sometimes alternated with swelling and pain of the joints, which were also apparently dependent upon emotional factors. Although investigations of the various types of arthritis have not resulted in as clear cut demonstrations of this relationship, it seems quite probable that here too similar mechanisms may be at work. (13) Allergic reactions, (14) such as hayfever, migraine, asthma or skin disturbances have also been shown to be closely associated with and perhaps largely dependent upon psychological mechanisms. This was also demonstrated in cases of atopic dermatitis. (15)

The whole field of psychosomatic medicine is in the early stages of development and is at present being systematically investigated. For further information on this subject the reader is referred to several excellent reviews of the available literature. (16)

The above described syndromes represent the majority of clear cut subgroups of the psychoneuroses. In actual practice one of course finds numerous instances which are not clearly differentiable. Many of the cases do not seem to be representative of any one single group but of combinations of several. Thus we find anxiety states with marked psychosomatic symptoms; hysterical conversion syndromes combined with compulsive phenomena and so on. In the clinical nomenclature these are usually placed under the heading of Mixed Psychoneurosis and it must be said that this group in itself takes in a large proportion of the cases of psychoneurosis seen in actual practice. Mention must also be made of a syndrome frequently designated as hypochondriasis. It is characterized by vague pains and aches unsystematically scattered throughout the body and accompanied by states of irritability, fatigability, and inability to concentrate. Actually it seems to consist of a combination of hysterical and neurasthenic syndromes.

Delimitation of the Concept. A detailed dis-

cussion of differential diagnosis is beyond the scope of the present contribution, since it does not deal primarily with practical clinical considerations. It seems advisable, however, to point out, in a general way, the main features used in delineating this group from other related disturbances since it would help to emphasize the characteristics peculiar to the psychoneuroses. With regard to other types of personality disturbances the most important conditions which should be considered in this connection are the Psychoses, particularly the so-called functional types. Etiologically these are closely allied to the psychoneuroses, although in the latter the dependence of the disturbance upon the psychological mechanisms described above is more frequently established and more clearly understood. The most important differentiating features are found in the clinical pictures. Such symptoms as clear cut conversions, obsessions, phobias, or psychosomatic disturbances are definitely indicative of psychoneurotic rather than psychotic reaction types. As opposed to these we find in the psychoses certain distinctive symptom complexes that do not occur in psychoneurosis. Distinct projections and distortions of external reality such as paranoid delusions or hallucinations do not occur in psychoneurosis. Similarly, primary mood disturbances, as we find them in the manic depressive group, intellectual deterioration as we find them in the organic psychoses, and disturbances of the affect and the thought processes as we find them in schizophrenias, should militate against the diagnosis of psychoneurosis. In a general way, then, we can say that the psychoneurotic disturbance does not affect the personality to as pronounced an extent either in depth or in scope as do the psychoses. Finally, the psychoneurotic as a rule has good insight into the fact that he is sick; and his adjustment, beyond his particular symptom complex, remains more or less unaffected.

Difficulties frequently arise in differentiating the psychoneuroses, particularly the conversion types, from purely somatic diseases. Here we must rely on the one hand on laboratory and physical examinations which, in the somatic conditions, would indicate the presence of an etiologically relevant organic disease. At the same time it must be remembered that the characteristics of a conversion symptom are determined not by anatomic relationships but

on the basis of the idea of the part of the body involved. Thus it is that glove and stocking anesthetics are practically unknown to occur on an organic basis, but are logically the types of anesthesia that would occur in conversions. Double vision, persisting when one eye is closed, precordial pain that is diffusely distributed over the general region of the heart and is not distributed down the left arm, all illustrate the same principle.

Another group of conditions from which the psychoneuroses must be differentiated are the predominantly constitutional personality disturbances, particularly those classified as psychopathies. Here we rely primarily upon the admittedly vague criterion of hereditary etiology. Taking into consideration the fact that constitutional characteristics cannot be definitely differentiated from those acquired early in life, we will have to admit that in a large number of psychopaths, psychoneurotic mechanisms may be at work and vice versa, that so-called constitutional characteristics may be largely responsible for the development of some psychoneuroses. The history of the occurrence of similar patterns of behavior in the ancestry and a fairly consistent failure of adjustment throughout the life of the individual, without any clear cut onset of new symptoms, would be a deciding factor in favor of the diagnosis of psychopathy.

Finally a word must be said about the difficult problem of differentiating psychoneurotic syndromes from malingering. It must be stressed that the latter term should be used only to designate consciously motivated, deliberate and sustained simulation of symptoms in order to secure a desired end. It is true that psychoneurotic symptoms too serve definite purposes, but this is not consciously appreciated by the patient and the goal attained need not be actually desired by the adult person. As a result, we find that a psychoneurotic symptom is frequently not related at all to the situation in which the patient finds himself at the time but is relevant to a much earlier setting. Furthermore, the psychoneurotic, unlike the malingerer, not only does not object to examinations but actually asks for frequent and thorough investigations of his symptoms. Finally, it must be emphasized that the symptoms of the psychoneurotic are just as characteristic of this group and as difficult to simulate as the symptoms of

organic diseases. As long as we keep in mind the fact that psychoneurotic symptoms are specific manifestations of unconscious psychological mechanisms, they will not present any greater difficulties in differentiation from malingering than the symptoms of any other disturbances.

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PSYCHOPATHIC BEHAVIOR: INDIVIDUAL AND GROUP.

—It is only within the past few years, aided by the insights granted by dynamic depth psychology, that the phenomenon of psychopathic behavior has been somewhat clarified. Until recently, this variety of behavior—disruptive, episodic, and aberrative—was regarded as either a natural consequence of a perverse biology, or as wilful and calculated waywardness. The several psychological schools reflected the first view; while the philosophico-religious championed the latter. Because the mechanisms of the condition were veiled, due to an inadequate investigative approach, it was possible only to describe the varieties of psychopathy as these were encountered in the clinic or in life itself. There resulted, then, from the prisons and police courts, from the clinician's office and the minister's study, a catalogue of types. The word "psychopathic" became a repository, a miscellany, wherein was fitted, with Krapelinian thoroughness, every instance of communally unsanctioned behavior, every example of conduct that did not accord with the usual or expected, and which could not be conveniently fitted under another rubric.

Perhaps the chief difficulty to the comprehension of psychopathic behavior, the main reason why it was for so long in service as a psychological waste-basket, was that it was

possibly the only aberrative condition which lacked a theme. In this, it remained unique among the disorders and diseases called mental. It was, so to speak, unintegrated, disorganized. In its afflicted, one could not point to a systematization of thought, as in paranoia, or emotive impairment, as in the schizophrenias, or mood alterations, as in the mania-depressions. One had only an illogical and almost implausible chaos of action and affect which mimicked every other pattern but yet managed to maintain an elusive distinctness.

This confusion had two important consequences. Not only were psychopaths unrecognized and misunderstood, but they could not be treated. The therapist was desperate in his search for treatment modes, and when these could not be found, he abandoned the whole thing with a convenient pronouncement that, for one reason or another, the condition was untreatable. In places where psychopaths were kept, they were exposed to the empiricisms of bright but unfounded notions, or subjected to "shotgun" methods that subsisted on trial-and-error, salted with prayer and exhortation. Equally significant was the result that science could only founder when it came to understanding and explaining the behavior of groups such as crowds or mobs in their psychopathic manifestations. And this, it may be, was a hiatus in knowledge more serious than any other, because of its social and political pertinence. Thus until psychopathy as an individual behavior variant was understood, and then this understanding applied to group psychology, such phenomena as the lynch mob, the anti-Semitic group, the Fascist party, and allied groupings, were beyond the ken of the psychological sciences.

The secret of psychopathic behavior has been uncovered by dynamic, depth psychology. The patient application of analytic principles has opened new avenues of approach to the disorder called *psychopathic personality*, and has, as a result, extended to both individual and group manifestations of psychopathy.

II. PSYCHOPATHIC PERSONALITY

In the light of modern research, it would appear that psychopathic personality is a valid clinical entity which circumscribes an individual who is both physiologically and psychologically unlike his fellows. It is a disorder, like all

others, with an inception, a course, and a prognosis. It is not (or should not be) used to describe anything which cannot otherwise be categorized. Perhaps it is best delineated in terms of predisposition and precipitation.

It would seem that the psychopath, as we meet him in prisons, hospitals, or in the ranks of certain political parties, possesses a physiology, a physico-chemical organization, somewhat different from other individuals. From Lombroso to Hooten, from every prison guard and hospital ward attendant comes testimony to the apparent if often unmeasurable departure from the normative in mere appearance alone of the psychopath. He is lither, more agile, trim, "cat-like" in his movements, inclined to appear more youthful. And in support of these hypotheses, there is corroboration from the laboratory. When his great bodily systems are tapped and measured, it appears that the patterns into which they fall under varying conditions are, in truth, recognizably and significantly different from those obtained with other individuals. From electroencephalography comes strong evidence of differential brain-wave patterning. That these appear too in the behavior disorder of childhood—which in every case precedes the full-flowering of adolescent and adult psychopathy—argues pointedly for the view that there is, to the disorder, a complex predisposing physiology.

However, despite the possession in any one individual of a predisposing physiology, the psychopathic behavior state does not ever become manifest unless it is touched off, precipitated, by certain crucial, traumatic, dramatic, and decisive events of early life. Exactly what these events might be is not quite so important as the effects they have, and we will not here be concerned with their enumeration. Suffice to record that they eventuate in a restructuring of the personality in such a manner that its components are altered. The developmental course is arrested before an adequate resolution of the oedipus situation has been achieved. The fixations of the preoedipal period are maintained throughout life and lead subsequently to the initiation of actional courses aimed at achieving or satisfying them. Since society is introjected through the father, and this is unsuccessful in view of the preoedipal terminus to development, the superego remains stunted, authority hereinafter rejected, sexuality chaotic,

morality deficient, guilt from residual fancies of incest and parricide always overwhelming, and fear of castration a permanent dread.

The concatenation of crucial events which conspires to produce the psychopath when it exerts upon a predisposed physiology makes the psychopath what he is—"the grown up child of the pleasure principle." He is essentially infantile, demonstrating the impatience of infancy, its megalomania, its tantrum behavior, its divorcement from the requirements of reality, its narrowing of the "time-sense," even its psychosexual diffuseness. The aforementioned are the basal traits and tendencies of persons exhibiting the disorder, but for the explanation of the direction the symptoms take, and the explosive, spasmodic nature of their motor discharge, we have to look elsewhere.

Many observers have been struck by the fact that the psychopathic pattern is not always ongoing, as in other disordered or diseased states. They have remarked how alike it is, therefore, to the convulsive disorders, to the epilepsies, choreas, brain lesions, encephalitis. This fact has led to the formulation of the interesting proposal that the outburst itself—whether it be murder, an attack, a destructive act, or what not—is no more than a physiologically directed attempt to restore a disturbed homeostatic balance. It would seem that, in the individual psychopath, the organism is the seat of conflict between the infantile needs and the prohibitions of society; that such a conflict produces an accumulation of tension which threatens destruction; that a point is reached where a motor discharge is called for and vented; that this discharge restores the dynamic equilibrium in Cannon's sense. As to the direction of the discharge, it appears to follow closely the essential requirements of the particular personality. *its* wants, wishes, desires, and urgings which *hark back* to the first years of its life.

III. INDIVIDUAL PSYCHOPATHIC BEHAVIOR

It has been necessary to review the propositions basic to psychopathic personality for an understanding of instances of psychopathic manifestations in individuals who are not properly classified within this disorder. The typical psychopath presents a group of classical symptoms and signs which form a pattern or syndrome. But there are elements of psychopathy in all of us which, when properly evoked, lead

to examples of behavior paralleling and even, at times, surpassing what we expect and get from the bona-fide psychopath. What has often been attributed to uncontrollable temper, ungovernable impulse, or temporary insanity, is actually the appearance in the behavior field of a basal psychopathic trend which has remained, until that time, dormant. The mechanisms which underlie and govern such behavior outbursts are ancient to the performing organism; but that which evokes them, precipitates them, is a situational affair somehow reminiscent of early unfulfilled dramas. The response, on such occasions, is perennially infantile, and the mode of aggression invariably replete with transparent symbols attesting to the primitive motivation at the core of the act. Fully to adhere to the implications of what has just been said would, of course, mean to discard a segment of law which, be it noted, is premised upon an apposite fiction. Moreover, an acceptance of this view calls for a re-examination of our culture, particularly of the medium in which our children are immersed during the first years of life.

In contrast to the roseate fantasies which romantically color even our scientific regard of early life, infancy and childhood are *not* especially happy periods. The child is oriented pleasure-wise, but denying and punishing reality obtrudes at every turn. Existence, until the latency period at least, is a series of weanings, each difficult and filled with frustration. To bear them, numerous and devious defenses are called upon. But the original wants remain, even if their collective destiny is to fester in the hindmost recesses of the unconscious. Here they form a less tangible but no less real counterpart of the physician's "area of least resistance." When, in later life, the environment provides that which touches upon such focal points, or which penetrates the defenses of the ego, they find expression in act.

We come now to the chief distinction between the group of individuals who are viewed as psychopathic personalities, and the broad segment of the population—if not all the rest of us—that reacts psychopathically on occasion. It is simply that in the first the usual response is psychopathic because it is the expression of a personality which has not erected ego defenses against the intimate urgings of infancy, nor has it an adequate superego to utilize for repressive purposes; with the latter, the under-

lying psychopathy is evoked situationally when the defenses no longer avail to protect against the buried wishes. That this is so, is attested by the fact that much of the argument characteristically employed by defending lawyers or shocked intimates of an offender is to the effect that the act "was so out of keeping with his usual self." The act of the psychopath is, then, a part of his total personality and predictable as such. The act of the non-psychopath is unpredictable and part of only a segment of his personality.

The following case from the writer's files illustrates the foregoing proposals:

Our subject is a Negro, N., who at the moment of writing is serving a life sentence for murder. He is a very personable young man of 26, sturdily built, cheerful, and of average intelligence. The nature of his crime and the act itself is incomprehensible to him. He states, "I just can't believe it. I never did anything like that before."

N. was born on a plantation in a Southern state in 1918. His birth was normal but was followed by septicemia in his mother, who died of it seven months later. N.'s father, a field hand, felt himself incapable of raising the child, and on the invitation of his dead wife's parents, gave the infant to them for rearing. The maternal grandparents owned a small cottage on the edge of a neighboring town, and they were happy to share it with their only grandson. Here N. was raised, amid congenial surroundings and with what passed for affectionate care. The elderly couple were not demanding in their attitude toward the boy, but the age difference was so great that they did not understand him. While to all outward appearances he was a happy and healthy child, he was essentially lonely. It is interesting to note that he attempted to alleviate his condition by resort to a common fantasy in childhood, the imaginary playmate. He constructed for himself the pleasing fiction that he had a younger sister with whom he constantly played. From the age of three until he was seven, the phantasied playmate was included in all his plans, accompanied him everywhere, shared in all his little triumphs and disappointments. When he was sent to school, however, and began to mingle with other children, she was unceremoniously "forgotten," although he later seems to have dreamed of her.

Moreover, N. today thinks that to "her" is due the entire credit for whatever happiness his early years held. It is difficult for him to describe the atmosphere of the grandparental home. He tells that he was not unhappy there in the usual sense: they were kind to him; but he had an alienated "feeling," as if "I didn't fit, didn't belong, somehow. Grandpa whittled me some toys and things to play with, I remember, but it wasn't like what other kids had. They were pretty poor, I guess, and very religious. As for recreation and things like that, I guess the best times I had were in Sunday School or Church. I really enjoyed myself then, but that's all I can remember about it. I don't know why I enjoyed myself so much in these places."

At 7, N. went to school. He made normal progress, and was considered a fair student from whom nothing spectacular could be expected but who was not an especial problem to his teachers. The town was fortunately situated near a Negro teacher's college, and the enthusiasm and drive of the young aspirants to the profession were communicated to the children in the school N. attended. Hence, they achieved a higher type schooling than most Negro children. The six year course was completed by N. in his 13th year. Although he toyed with ministerial notions for awhile, the need of his grandparents was so obvious that he decided to go to work.

N. obtained employment on a large market farm as a gardener. He was a hard and steady worker whom the owners immediately recognized as trustworthy, and before long he was taken into the home of the wealthy landowner as a sort of second cook. At seventeen, his employer retired and moved north, taking N. with him to a large Eastern city. Soon after this the employer was divorced from his wife, and set up separate quarters in another city. He retained N. as his cook and seems to have had implicit confidence in him. He writes that N. was a faithful employee, even-tempered and generally stable, "although on two occasions I had to get him out of minor difficulties with the police. Once he was arrested for speeding in one of my cars, which I had permitted him to use for marketing, and another time he went on a spree and was detained for disturbing the peace."

When N. was 20, he married a girl whom

he had courted only a very short time. After three months of marriage, his wife confessed to him that she was pregnant by another man. This admission led to a quarrel which eventuated in their separation. N. says of this that he felt betrayed and shaken by the incident, and when his first anger had worn off he set about to find his wife, intending to offer forgiveness and to reunite with her. His efforts to find her, however, were unavailing. In 1941, N. was inducted into the Army.

N.'s military record is clear. He was regarded as a good soldier and was promoted to a corporality after the first nine months of service. Following basic training he was attached to a unit which performed guard duty over stores awaiting shipment at an Eastern port. Meanwhile he met and fell in love with an attractive girl in this city, whom he at once married. They set up housekeeping in an apartment in the Negro section of the town, and for a few months N. was very happy. He believed his wife was devoted to him and was, for a time, secure in her love. It developed, however, that the girl was taking advantage of him. During his absence she entertained other men, was extravagant with his pay, and soon took to berating him for his "lazy Southern ways." Their relationship deteriorated rapidly.

One night N. was returning from duty when his attention was attracted by noises coming from the interior of an Army truck parked near the house in which he lived. As he neared it, he thought he recognized his wife's voice. Lifting the canvas, he dimly perceived a couple engaged in intercourse. Without loitering to make a further investigation, he sprang into the truck, pushed aside the man (who immediately took to his heels), and proceeded to strangle the woman. Only when she was dead did he discover that it was not his wife.

N. reveals that once he had his hands around the woman's throat he could not let go. He says that all the rage and disappointment that had been smoldering within him seemed to overflow and his one preoccupation was to hurt. Later he could not account for this overpowering desire and stated that it was completely foreign to him. When asked whether he had felt that way at the time of his discovery of his first wife's infidelity, he denied it, saying, "No, I was just angry, but I didn't want to hurt her or anything like that."

On investigation it became apparent that the motivation for the murder had its roots in infantile and childhood frustration which the situation re-evoked. N. was threatened with the loss of his love object, with the loneliness which in his early history had driven him to invent a character to share in his life. The response was typically psychopathic—impulsive, primitive, aggressive—utilizing mechanisms which are supposed to be alien to adult life. It was as if all his lifelong striving for regard and affection broke out of bounds in a single agonized protest for the expression of which he was equipped only with aggressive tools. The act of murder in itself was foreign to his personality as we view it now or in the light of his history; but below the surface, awaiting just such an occurrence as transpired, boiled the infantile longing, the threatened withdrawal of which led to murder.

Individual behavior of a psychopathic variety can be understood only through the comprehension of the devious motivational elements which underlie every such act. It seems that a situation is encountered which threatens the organism with a reawakening of the anxiety attached to an infantile conflict between wish and prohibition, and it is the spilling over into catastrophic, eruptive act which we observe. Alternatively to this formulation are the cases in which a psychopathic manifestation is evoked by the situational representation of scenes and events which in earlier years led to a type of behavior which has been repressed by severe cultural and educational training. Here there is no special surge of anxiety, but an understandable and explicable failure of the usual inhibiting mechanisms. The narcotization of the ego and its defenses by alcohol provides numerous examples in this category.

IV. GROUP PSYCHOPATHIC BEHAVIOR

We are not concerned here with the manner in which groups come into being, nor even with those interesting phenomena such as panic and riot. We shall deal, rather, with the dynamics of the transfer of psychopathic impulses from a nuclear origination to persons who ordinarily are free from the type of behavior they demonstrate subsequent to their infection, so to speak, with the pathogenic source. Our case material will be the events of the past two

decades, as well as a unique illustrative occurrence which the writer has had the opportunity to study intimately.

Most of us are capable of keeping our aggressivity under control. Against the primitive urgings of a megalomaniac infancy and the unfulfilled wishes of the first decade, we have erected barriers. By sublimation, reaction-formation, severe repression, and other techniques we have become accomplished in draining the tensions daily living accumulates, in obtaining part-satisfactions, in regulating or adjusting overt performance so that it achieves the appearance if not the reality of conformity. This entails a constant alertness, a moment-to-moment re-adaptation. When, however, and for any reason, the controlling mechanisms no longer suffice, there follows the roll-call of distress, including neurosis, criminosis, or psychosis. At such times, the diverted or repressed spills over into symptom or action, depending upon the predisposition of the organism.

The bonds which make for the coherence of a group are libidinal (in the sense of sympathetic or mutual interest) and identifying (in respect of vector orientation toward a person or an abstraction). Hence, it is to be assumed that certain common motivational elements are present in the individual components, and that the personality structures of such components have areas of resemblance. Furthermore, it is again to be assumed that in order for the two foregoing propositions to be realized, there must be some experiential correspondence. And, indeed, if we project for examination such manifestations as, for instance, the spread of Fascism, or the several shirted and anti-Semitic, anti-Catholic, anti-Protestant, or anti-Negro movements here and elsewhere, we discover all of this to be beyond dispute. The tenacious hold which Fascism obtained on the Germans, the Italians, and other peoples was achieved, be it noted, chiefly among the middle-classes, the members of which had been disinherited and dispossessed. These had passed through and been scorched by the aftermath of the first World War, the inflation and the displacement from their accustomed station. They had shared in the common experience of insecurity and anxiety. Moreover, this is similarly true of the underprivileged white who engages in scapegoating techniques in our South, and of the economically insecure and anxious inhabitants

of Northern industrial centers who live under the constant threat of unemployment and in an atmosphere of competition.

In essence, the conditions sketched make for the *anlage* of group psychopathic behavior. The libidinal common-ground cements the group, while from the identifying vector comes the preparatory "set" for the reception of psychopathic precipitants. The separate personalities, then, commonly share similar frustrations, thwartings, desires, and powerful urgings. When exposed to the basic psychopathy of their leaders, they respond psychopathically. What occurs is that, either by design or happenstance, the proper formula for the awakening of the latent psychopathy within the group is enunciated. The formula stirs the infantile sediment which besieges the ego. The image of the leader, as well as his example, is incorporated within the super-ego, thereby weakening it. Direction of the individual personalities is taken over by ancient components, uninhibited by subservience to superego, and governed chiefly by identification with the Ideal ego, the Leader.

The formula for the awakening of psychopathic behavior within the group is amazingly simple. It consists merely of making a direct and forceful appeal to the primitive hungers of infancy, to promise the satisfaction of buried wants, to provide an object for the accumulated aggressivity, and to project as attainable the longed-for autocracy of cradle times. Those slogans which accomplish such aims are familiar to all of us from the Caesarian "bread and circuses" to the incoherencies of the Horst Wessel song.

The prime requisite for the production of psychopathic group behavior is that the leader, the organic centrum of the group, must himself be of psychopathic character. He must conform closely to our sketch of the psychopathic personality, but in addition possess those leadership qualities that have elsewhere been delineated so well. It is from him (them) that the impulse must originate. Evidence for this comes from an examination of historical types, from a knowledge of current leaders, their writings and speeches, and finally from the significant fact that commemorative plaques in testimony to fallen fascist "heroes" are to be found gracing the sites of taverns, dens, and suchlike places.

A highly instructive episode which neatly

demonstrates the essential validity of these propositions regarding group psychopathic behavior was the recent mutiny in the U. S. Federal Penitentiary in Atlanta, Georgia.

In the early evening of a December day in 1944, a unit of the Federal institution in Atlanta was taken over by the inmates housed therein. The custodial officers on duty were confronted by convicts armed with knives constructed of metal scrap and other debris, and were deprived of their keys. The unit was an out-building of the institution that had been designed for special usage and was therefore relatively self-sufficient. A section of it was devoted to the reception facilities and Quarantine housing of new admissions to the institution, while the remainder served as a special treatment section for the management of such inmates who needed to be segregated from the general population for particularized institutional therapy. Those who comprised the latter group were either diagnosed psychopathic personalities, maladjusted and maladaptable characters, or persons who had demonstrated either unadjusted or psychopathic trends. It was an homogenous population in respect of their being Federal prisoners with rather lengthy criminal histories, of possessing established anti-social tendencies, of being unsuited for custody with the rest of the institution's population. Other particulars of correspondence are not important for our purposes here.

Now, the leaders of the mutiny, the original planners, were three in number. One was a sexual psychopath, another an emotionally unstable psychopath, and the third a criminal psychopath. The last mentioned was The Leader. He was the sexual object of the first, and the demigod ideal of the second. This Leader, whom we shall call K., was well-known to this writer, who had examined him two years previous to the mutiny. The psychiatric report prepared at that time was as follows:

The subject's attitude during the interview is slightly antagonistic, although as the interview progresses he becomes warmer in his relationship with the examiner. His stream of speech is coherent and relevant, delivered with unimpaired psychomotor rate. Emotionally he is regarded as highly immature and very unstable, with a predominance of anti-social and aggressive tendencies that have already reflected them-

selves in a long series of disciplinary infractions at the transferring institution. He acts on an egotistical, impulsive level. He is regarded as a great custodial risk, from all points of view, including escape. Emotional responses are cold but fairly appropriate.

His content of thought shows a preoccupation with his own desires and wishes, and an inability to withstand any kind of authoritative control. Sensorium is intact. He is well oriented. General knowledge and intelligence are on an average level. Insight at the present time is completely lacking, and he is obviously a risk as far as judgment is concerned. He is a frontier type of psychopath who has even engaged in the classical crime of cattle rustling. He is aggressive, anti-social, sullen, impulsive, and a disciplinary hazard.

The purpose of the mutiny is not clear. There is some hint in the investigation which was subsequently conducted by the authorities that it was an escape plot, but the leaders have generally denied this. The ostensible aim was to obtain a hearing for the "grievances" which the inhabitants of the unit held against the institutional authorities: however, on examination, these complaints are composed of the usual petty "gripes" and protestations of injustice common in all prison situations, and they are relatively insignificant. The single major item of classification, common to all involved, was the fact that they were housed in the same unit with German prisoners. What is more likely and is, indeed, apparent in the investigation to which the author was made privy, was that the idea of mutiny was a spontaneous readjustment initiating in the three leaders with the design of fulfilling their basal needs and providing real if only transitory satisfaction of stored wants. Subsequent events prove this statement. In what followed the commandeering of the building, K. achieved the power he craved by the bold maneuver; Z., the sex psychopath identified himself with K. and touched off an orgy of homosexual indulgence; Y. destroyed property and energetically drained his tension.

Following the act of appropriation, the three enlisted the cooperation of the other inmates. Exits were barricaded, property destroyed. The unit quickly resolved into a psychopathic society, with its hierarchy of command and other features that write in red letters the frus-

trations and longings of the inhabitants. During the course of the next days, the little society became the means whereby expression was given to the most intimate and repressed wishes. Rapid infection of the whole unit population with the psychopathic virus occurred. The sexually frustrated found outlet in homosexuality, under the supervision of Z.; authority was flaunted, aggression vented, and power exercised by those of K's. type; while the Y's. experienced the widest possible horizons for their talents.

Capitulation and surrender came when the so-called 'demands' were published in the local newspaper. This was the ostensible cause. Actually, the real reason was that the leaders had achieved as much as they could in the face of adamant and unyielding superiority, and the preparations for withstanding a real siege had been pitifully inadequate. What is most interesting to us, however, is the fact that latent psychopathy was communicated rapidly to the extra-unit population. Psychopathically inclined prisoners in the shops and housing units attempted to stir up trouble. They were not successful, mainly because the officials acted with precision to nip these efforts in the bud, and because the population of the rest of the institution lacked the libidinal coherence of the unit and did not identify with the leaders of the mutiny.

Here, in a minuscule and momentary glimpse of group psychopathic behavior, we have revealed the essence of the phenomenon.

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PSYCHOLOGY AND CONTEMPORARY PSYCHOPATHOLOGY.—The years 1926 and 1940 are set as limits to the period discussed. The former marks Kraepelin's death. Until then, psychology's contributions to psychopathology were dictated by orientation—not so much in his psychiatry as in his Wundtian-derived research. Bentley (15) protests that psychology's investigations were made without knowledge of Kraepelin's experimental methods and results. This may have been so—for Wundt himself had noted that the exceptions to psychological laws are more numerous than the agreements and that their significance could be determined only through a study of "characterology," an observation which seems to have been overlooked by psychologists, but which engaged Kraepelin's special attention. So even more regrettably, psychological studies seem to have been made without knowledge of the principles underlying the Kraepelinian systematization of psychiatry. Nevertheless, review was easy; one could, if one wished,—and as Bentley did, limit and simplify the field "by setting aside for a different context most matters pertaining to psychoanalysis."

1940 marks a delineation of the psychologist's frame-of-reference by Allport (1, 2), which will serve as a background for defining the relations of psychology and contemporary psychopathology. Among the accelerated trends are: a striking rise in the employment of statistical aids, the use of animal subjects, the spread of physiological research. "Operationism is the current watchword of an austere empiricism." These, however, do not completely obscure the gropings towards reinstatement of the individual, of the Ego and towards humanism.

For the Ego and intimations of humanism psychology is indebted to psychoanalysis. As Allport (1, 2) puts it, "psychoanalysis marked an inter-regnum in psychology between the time it lost its soul shortly after the Franco-Prussian War, and the time it found it again, shortly after World War I." As Thomas Mann says, "Freud will . . . be honored as the pathfinder towards a humanism of the future."

Two books highlight the situations in 1926 and 1940. The first is W. S. Taylor's *Readings in Abnormal Psychology and Mental Hygiene*. The second is S. S. Tomkin's *Contemporary Psychopathology*. They present striking differ-

ences in viewpoint, aim and content. The authors of 1926 treat psychoanalysis with depreciative consideration;—whereas those of 1943 illustrate in various ways the importance of psychoanalytic theories and principles to the furtherance of psychology's development, especially in the field of psychopathology. An excerpt from H. A. Murray's introduction may enable the reader to anticipate what and what not to expect from the present discussion:—

"Here there are no orderly nosological definitions, no systematic accounts of the diagnosis, treatment and prognosis of every disease entity, no painstaking descriptions of eccentric mental states. Instead you find throughout a ceaseless occupation—speculative, clinical or experimental—with problems of dynamic interaction, of genesis and causation. The participants in this symposium are not so much concerned with descriptions of abnormal phenomena . . . , but with explanations of these phenomena, with the origin of, the development of, the dynamics of, the influence of, the psychogenesis of, this or that particular process or condition."

This suggests that our topic may be envisioned as Psychology and Psychiatry and Psychology and Psychoanalysis. Each sub-topic is a vast one, and I can do no more than to comment on one or more aspects of each.

In psychiatry, psychology still clings to the Kraepelin tradition, at least, to what psychology presumes it to be. This orientation is most clearly and intractably expressed in prevailing methods and hypotheses.

An epitome of the methods is contained in (1) Babcock's (5) *A Scale for the Measurement of Mental Deterioration* and in (2) the various "psychometric efficiency levels for psychotic and age classifications." The former was constructed on the assumption that the vocabulary score is an index of pre-psychotic efficiency, and generalizing from data of study of the organic psychoses, it assigns an organic etiology to schizophrenia or in Kraepelinian terms, dementia praecox. This scale is widely employed in its original or modified forms. The "psychometric efficiency levels" themselves are a modification and extension. These, according to Wittman (87), "cannot be expected to take the place of a specific device for measuring either intelligence or deterioration"; they are intended merely to replace "the subjective and

qualitatively descriptive 'tests of mental sensorium' previously given by the staff physician during the regular mental examination," and "to permit a precision otherwise lacking in mere clinical observation."

The importance of such methods in clinical routine is unquestioned. They are relatively unilluminating and yield no clarifying hypothesis regarding the characteristics of psychotic thinking responsible for the relatively poor performances. Their premises need to be re-examined. For example, Altman and Shakow (4), among others, have shown that the vocabulary performance itself is an imperfect indicator of mental ability; whereas Cattell (21) insists that observation and description must precede measurement and that in these respects psychology has yet to attain the technical level of psychiatry.

An epitome of the hypotheses is presented by Hunt in *Personality and the Behaviour Disorders*:

"We have chosen the term deficit to designate this loss of efficiency because it is a neutral term. Dementia, deterioration and regression, although more prevalent, have become associated with various beliefs about the nature of the loss. Since we prefer to test these various assumptions with the results of investigation, we prefer a neutral term. Deficit has not been associated with any such implications. As used here, it is an operational concept. When any person performs in some situation at a level of efficiency below that expected from comparison with typical individuals or from some indicator in his own present or past behaviour, that person manifests a deficit."

Hunt's aim is "to reduce every aspect of deficit to a truly measurable variable," and he believes that "rate of performance and rate of learning" are "readily quantified by using time as a variable."

Naturally he finds difficulty in reviewing and analyzing the field, more because measurement has so infrequently been preceded by observation and description than for the reasons he gives:

"Unfortunately for the expositor, the studies in this field are not held together with any single purpose or theory. The methods vary tremendously. Rarely has any investigator carried out a consistent program, or even used a single technique, on the whole gamut of clini-

cal conditions. These facts make it impossible to generalize with certainty. . . . We hope, nevertheless, that this chapter . . . will serve as an object lesson concerning the pitfalls of the field. . . ."

And thus he fails to avoid the very pitfalls against which he himself so competently warned in 1929 (53)!

The primary goal of psychology's efforts in psychiatry has been to provide clinical tools as aids in diagnosis and prognosis and—since the advent of shock therapies—evaluation of treatment. Research has been by-passed or been evolved gratuitously, thanks to statistical aids, as a secondary gain.

The procedure is to cut out of the flow of a psychotic's experience a particular phase marked by this or that conglomeration of symptoms. The phase is one of accessibility or cooperation—hence the preponderance of studies of schizophrenics, particularly paranoid schizophrenics. Yet nowhere in psychopathology are there more fundamental problems—and less agreement, since so very few psychologists have been content to evolve methodology from observation and description oriented in the 'known facts' about psychotic behaviour and too many have insisted *a priori* upon "a single purpose or theory." All this constitutes a representative sampling.

The psychotic is then presented with an available test or tests. These were originally constructed for use with the normal and even in the case of the normal their scope and depth in pertinence to measurement of intelligence have been, and are still, being questioned (81). Yet when applied to psychotics, there is not even a preliminary inquiry into the material, formal, and functional aspects (81), or into the ways in which these aspects of tests, especially the functional, prejudice findings. And there is but little appreciation of the fact that tests merely provide clues to the ways in which an individual orients himself to the external world and to himself, to the ways in which he organizes and evaluates his behaviour and the external situation in terms of this orientation. Ignoring the evidences of psychology itself, the patient's performances on tests are transmuted into a score, an index, or a quotient—suggesting that the mental life has but a single dimension.

It is difficult to delineate the frame-of-refer-

ence of this approach **except in negative terms.** It includes no intimation that:

The world in which the psychotic lives is not the same as the world of which he speaks and thinks, and the world of which he speaks and thinks is not unaffected by the world in which he lives. Kraepelin himself denies this possibility when he writes that "the association experiment strikes chiefly at the crystallization of the habits of speech, which are for the most part little influenced by the disorders."

The 'osis' in psychosis, as aptly phrased by Federn (27), refers to the fact that "mental functions which disappear grossly are not lost potentially, or entirely—each function might become temporarily reestablished."

The psychotic is not deceived by the fancied aloofness of the psychologist; at least for him it is not a "detached, objective scientific curiosity. As Eissler (26), among many others, has shown, a psychotic's experiences may be reorganized and reevaluated, again and again, on the basis of "silences," a chance word, gesture, or look, of interest, diffidence or indifference from psychiatrist, attendant, nurse, or attitude and even on the basis of hospital attitudes towards diagnosis, prognosis, and therapy.

Yet all these—and more—enter into the psychotic's test performances! But these and other insights have evolved from the scientific endeavours in neurology and in psychoanalysis, in psychobiology and in psychology itself. Space does not permit review of the fruitfulness and significance of these endeavors. Kraepelin-biased psychology manages to escape these insights by avoiding intimate contact with its subject material. It is curious that it can—no one would question Wundt's pioneering the field of reaction time measurement, though he might question his *ex deus machina* self or ego; yet Wundt in speaking of the exceptions to psychological laws and in encouraging the study of "characterology" could only have been referring to the many inner determinants of experience. It is not so curious when we note the statement made in 1908 by Ferenczi (21):—

"The dominance of the materialistic and mechanistic point of view in the nineteenth century first misled psychologists and psychopathologists to renounce the *naïve but honest introspective psychology* and to imitate the experimental methods so successful in the natural sciences. Finally, it went so far that doctors

and natural philosophers handed over as unworthy of their consideration the great and little mental problems of humanity to the writers of *belles lettres*, and confined themselves more and more to the task of the registration of the physiology of the senses. Since Fechner and Wundt, hardly anyone has animated the dead matter of experimental psychology with an in any way informative idea. Freud's exertions have succeeded recently in joining up the broken threads connecting scientific psychology and daily life, and in making a scientific field that had long lain fallow fruitful once more."

In psychoanalysis, if we exclude the efforts of neurology, psychobiology, and even psychology in "joining up the broken threads," we find that—Murray's glowing account notwithstanding—psychology, unhappily, has made little more than a beginning in appreciating the importance of psychoanalysis to its own being. Documentation of this beginning is impossible; it involves reporting upon contributions which have not been labeled as pertaining to psychoanalysis. Instead, we propose merely to intimate how and why psychology has been swept into, shied away from, or competed with psychoanalytic currents, to indicate the status of the rapprochement of psychology and psychoanalysis—and the forces impeding a more intimate, fused, relationship, to offer suggestions as to strategic points of inquiry and thus—perhaps—to dispel the illusion that there are some problems, if any, that psychology may 'profitably' investigate without reference to theories and principles outlined by psychoanalysis.

"Dreams," wrote Freud, "are particularly fond of reducing antithesis to uniformity or representing them as one and the same thing." Operationism, as *mistakenly* practiced in psychology, is likewise fond. It must be stressed that current operationistic practices seldom correspond to the concept as introduced into psychology by Boring, Kantor, McGeoch, Stevens, and Tolman. It must be emphasized also that these men have not claimed that the values of operationism lie in its *novelty*—Fechner and Wundt's methods were operationistic, as were also Ebbinghaus's (vide his statement of propositions strictly in terms of the measurements employed). If we recall the psychologist's frame-of-reference, we will not be surprised to

find that psychology in psychoanalysis creates antitheses where there are none and reduces them to a single dimension after it has *accepted* what it *likes* and *rejected* what it *dislikes*. With psychology's attitude towards the theory of the dream as an example (50), we note that acceptance is often anonymous and rejection is often in terms of argumentum ad persona. In some instances, acceptance is related either to greater familiarity with psychopathologies or to a deeper comprehension of the theoretical implications of psychoanalysis,—it is not related to priorities or other esoteric issues. Rejection, however, is usually based on sophistries about phantom issues.

A *profile* view of psychology and psychoanalysis serves as the basis for further discussion. Regrettably, it throws into sharper relief the defections of psychology. Consequently, the rejections will be outlined in greater detail. But, happily, these serve to illustrate how decisively the psychologist's frame-of-reference interferes with his realization of the vastness of the problems he ventures to solve.

As in psychiatry, there is a concentration on *clinical psychology*. This was accelerated by Murray's (67) suggestions for the investigation of fantasy and reaccelerated by Frank's article on Projective Techniques. In the latter, the projective techniques were likened unto those of the physical sciences; this analogy, more than anything else, induced many psychologists to become actively interested in methods hitherto regarded as unscientific, mainly because they were deemed unquantifiable, and therefore ignored.

Notable among these techniques are the Rorschach, the thematic-apperception test, and graphology. Beck and F. L. Wells introduced Rorschach's test to American psychologists; Beck's contributions, as well as those of Piotrowski (69), are too well known to necessitate calling the reader's attention to the fact that their significance is not derived from analogies to the data of the physical sciences, but from intimate contact with their subject material. Murray formulated the thematic apperception test, and, as Wells puts it, psychoanalytic insights were undoubtedly involved in raising the Stanford-Binet pictures to the level of a projective technique. June Downey introduced graphology in the form of *Tests of Will and Temperament*; their derivation from

observations noted in 'classical, academic' experiments and from preliminary observations and descriptions of psychotic patients becomes apparent when one re-examines these tests.

Although the origins of the projective techniques are not grounded in the physical sciences, many psychologists insist upon their meeting the requirements of these sciences. Research seems to center mainly in polemics over the comparative merits of the techniques or in delimiting their applications. Where "operationism is the watch-word of an austere empiricism" the law of parsimony is concentrated upon method and instrumentation and rationale rather than upon theories and principles.

To believe or to insist that any one technique can give a fully rounded picture of an individual's personality, that any one technique is equally informative for all individuals (psychotic, neurotic and normal), or that any one technique is limited to one aspect of the personality (the Rorschach, for example, is supposed to reveal the basic structure, whereas the T. A. T. is supposed to reveal form and content) is to belie familiarity with even Murray's and Frank's formulations. Murray proposes not one but fifteen methods, whereas Frank lists and classifies an even larger number.

Consequently, there is a tendency to ignore the cautions indicated in the literature, especially in the literature pertaining to the T. A. T. Newman, for example, points out that "a single language symptom, though isolated in the descriptive analysis, does not provide a valid point of departure for interpretation"—mis-spelling in one case may mean a revolt against formal conventions; in another it may indicate inadequacy in an activity which the subject regards as essentially adult and beyond his abilities; whereas accuracy may indicate a compulsive interest in carrying out stereotyped performances and in repeating mechanical details. And Balken, in studies employing the Rorschach and the manifest content of a remembered dream in addition to the T. A. T., demonstrates the necessity of considering the dynamics and mechanics of the intrapersonal testing situation in the identifying of variables and in the interpretation and evaluation of findings and finds that the productiveness of even the Rorschach is enriched if evaluated likewise against French's concept of the organization of the individual's behaviour for wish-ful-

filment. The dynamics of the intrapersonal situation have been illustrated in a series of studies with adults and children, psychotic, neurotic, maladjusted, delinquent, or normal; the mechanics refer to features such as the vis-a-vis position, method of recording, and timing. Tentatively, it is found that the "efficiency" of the techniques is a function of the subject's personality and of the investigator's aims. If the latter are exclusively to provide aids to clinical diagnosis, it may be presumed that the Rorschach reigns supreme.

If they are directed towards scientific study of personality, ideally one should employ as many techniques as the limitations of clinical, school or other institutional routines permit and, equally important, the age and sophistication or non-sophistication of the subject. No one technique yields a self-contained picture of personality; sometimes the one supplements and confirms the data of the other, sometimes it gives information which overtly seems to contradict the other—yet these very contradictions are the clues that scientific research seeks to note, describe and classify with a view ultimately to explain. The form and manifest content of a remembered dream is found, tentatively, to parallel that of the phantasies in an as yet clinically undefined group; it is opposite to that of the phantasies in conversion-hysterics—whereas the phantasies are rich, lengthy and absent in manifest anxiety, the dream is filled with terror and inhibition or paralysis of action; and the dream of patients evincing schizophrenic mechanisms is a recurrent one, dating back to a very early age, and often appearing in waking life so that the patient is unsure as to whether it is dream, phantasy or hallucination. The latter tentative finding suggests another orientation for study of the Rorschach and the T. A. T.—it may be noted here that the order of administration is as follows: Rorschach, T. A. T., and a remembered dream. In further exemplification of the supplementative, confirmatory, and contradictory features of information obtained with projective techniques, we cite the case of a 'neurotic' subject whose phantasies were relatively uninformative until related to the Rorschach findings; they then could be interpreted as indicative of an immature ego-development and aided in understanding the narrow range of interests evidenced in a subject whose everyday

interests and information covered ornithology, science, literature, music and the theatre.

There is no need to restate the insights—and their sources—which, as noted above, have been ignored in psychology and psychiatry. It must be stressed, however, that they apply over the whole range of human behaviour—with different emphases in the psychotic, neurotic and normal. What were sins of omission in the context of psychology and psychiatry are sins of commission in this context, since projective techniques are too often applied and evaluated in a professed psychoanalytic frame-of-reference, but, with the support of the analogy to the physical sciences, are assumed to be the “foundation of a new and broader psychometrics” and of “the formulation, on experimental grounds, of psychological theories of personality,” where hitherto “most conceptual formulations have come from psychoanalysts and psychiatrists.”

Clinical psychology calls for more than passing mention, partly because it is inextricably related to research, partly because the values of the projective techniques are greater than those of clinical methods in psychiatry and hence the hazards are greater. They have an “efficiency” beyond merely lending “a precision otherwise lacking in mere clinical observation.” They do not merely supplement information obtained from intelligence and vocational tests; they yield information often only obtainable in the interpersonal configuration of psychologist and subject and may yield information which may anticipate by months that brought out in a psychoanalysis or in psychotherapy. Investigation of the reasons for this is legitimate research, more so than mere accumulation of records; but it must be stressed that information, however illuminating, is not per se therapy.

However, we must pass on to *theory* and *experiment* in psychology and psychoanalysis.

Here, the aims are primarily ‘experimental validation’ of psychoanalytic concepts and the construction of uniquely psychological theories.

The experiments are so designed as to call for a maximum of peripherality and a minimum of context, content and choice. In short, they are limited to evoking individual peripheral manifestations or processes. “A process . . . is individual peripheral,” as defined by Waelder (81), “if it is unaccompanied by internal conflict, as in the case of the satisfaction of certain

needs which are more or less common to all men and approved by the super-ego, and if the means employed in obtaining this satisfaction are known and legitimate.” Pickford’s (68) study of imagination and the nonsense syllables and Barker, Dembo, and Lewin’s (12) study of the PGR to a subliminal tone lead one to doubt that even the ‘purest’ S-R or ‘operationistic’ situation is conflict free. Psychology deftly by-passes this in devious ways: it erects barriers and distances—via animals, instrumentation, or paper-pencil—and stop-watch and desk. Over these neither experimenter nor subject dares trespass: this would violate the illusion of ‘objectivity’ and thus force subject and experimenter to become aware of their mutual involvement in the stream of events labeled ‘experiment.’

The theories are often merely transliterations of some illusory, specifically undefined aspect of psychoanalytic theories and principles into the often inimical and obscure idiom of the speculator. Sometimes they are deduced from experiments which create psychophysical or psychobiological organisms and force them to wander as marionettes over the air-blasted, electrified, flat surfaces of Operationism, in the configurations of Gestalt, or in the vector-darted fields of Topology,—and these experiments are presumed to be paradigms of situations encountered in the everyday experiences of psychoanalysis. Sometimes the theories are deduced merely from contemplated experiments. Underlying experiment and theory is the conviction—as William James protested—that no conclusion about human behaviour is quite so scientific as one derived from the twitching of a frog’s legs—particularly if the frog is decapitated.

Psychology emerges from experimentation and theorizing in psychoanalysis with a number of doubts, disbeliefs, and convictions—for the ultimate aim, as in clinical psychology, is not merely ‘validation,’ but the construction of “a systematic psychology of personality,” which will “be based on behavior rather than experimental data.”

A few psychologists despair that “the sheer testing of psychoanalytic theory is an appropriate task for experimental psychology,” and having attempted it, grudgingly admit that the theory does not require validation (74).

In only one instance—and here it must be

remembered that the present discussion pertains only to a *profile view*—is an experiment prefaced by a serious, objective attempt to acquire familiarity with psychoanalytic theories and practices as they have been developed clinically on the human level. The investigator, O. H. Mowrer (66), indicates an aspect of experimentation in this area, which, significantly, has been overlooked by psychologists—namely, its *pedagogical* usefulness, in the sense that “it provides a more general opportunity for first hand contact with clinically discovered phenomena than does the clinic itself and supplies paradigms that may be especially useful as aids to the clearer conceptualization of the psychological principles involved.” It would be wise to extend this attitude to clinical psychology, as well as to experimentation in general.

Psychology insists upon maintaining the fiction of the normal-abnormal antithesis. It clings to a Normal and an Abnormal Psychology. It adheres to the Gaussian code (41). Neuroses are quantitative exaggerations of the normal, psychoses, in turn, of the neuroses. It thus betrays ignorance of the best-developed and best-documented chapter in psychoanalysis (28). It is thus unprepared to realize the implications of the principle that study of the neuroses offers the strategic point of inquiry into the normal and the psychotic and thus cannot fully grasp that the alpha and omega of all psychology—wishes, anxieties (including internal) and the defenses against anxiety—cannot be reduced to a single, linear dimension. It thus ignores even its own evidences accumulated in the course of investigating perception, reaction time, learning, fatigue, intelligence, and so on.

Psychology has no doubts about the justness of its concept of normality. The concept predicates efficiency, but even efficiency is a closed issue—except for formulation presented by Thibaut (77) and premised on Burrows' phylobiology. It is a closed issue, because the “efficiency” of available methods have blinded clinical and experimental psychologists alike to its “artifact” nature. In psychoanalysis, however, the concept has always been a vital issue, not merely a luxury that the moment can or cannot afford,—of importance in both theory and practice. It is invariably woven into the texture of psychoanalytic discussions, especially in those pertaining to character-formations, which, in the long run, emerge from psycho-

logical tests as ‘essentially normal’ and often constitute a goodly number in the tribe from which norms are derived. Currently, the issues embraced in the concept of normality, notably efficiency, are receiving special consideration by Fenichel (28), Glover (41), Hartmann (47), Ernest Jones (57).

But psychology screens itself from its own fundamental problems. The besetting problem, currently, is *frustration*. The theories insist that frustration always leads to aggression; experiments are designed or proposed to prove this hypothesis. Frustration is usually defined in terms of the external situation alone. Nothing is said of the individual's internal reactions to or perceptions of these external situations, or of the more positive and developing effects of frustration in the processes of intelligence and the organization of behaviour. Objective anxiety—albeit camouflaged—at least is being admitted to psychological respectability. Wishes, guilts, internal anxieties and defense mechanisms, however, are still treated as esoteric or as pathologic phenomena. But let psychology speak for itself, via an excerpt from Britt and Janus (19):

“The investigation of *frustration* as a key to the problems of normal as well as of abnormal motivation has been essayed on a number of fronts recently, although its significance was already implicit in the work of G. Stanley Hall and of Pavlov.

“The fruitfulness of the work on this problem is seen in many studies of the past five or six years, including among others those of Anderson, Barker, Dembo, Lewin, Clites, Haslerud, Karn, Liddell, Maier, Mowrer, and Rosenzweig. From a theoretical standpoint, frustration has been heralded as a technique for investigating the nature of the intellectual abilities; as replete with physiological, as well as psychological, implications; and as a factor in lessening the ‘artificial division which now separates normal from abnormal psychology, and abnormal psychology from theoretical psychiatry.’ Nevertheless, caution should be exercised in adopting without qualification certain generalizations such as, ‘creation or growth and frustration or thwarting are merely two aspects of the same life process.’

“It would be difficult at the present time to postulate a definition of frustration that would find ready acceptance among all investigators.

A number of definitions have been advanced, each seizing upon some essential elements of the frustration process to the exclusion of other equally important aspects. However, these will usually be found to have more in common than may at first appear to be the case, with any sins being those of omission. Some criteria of frustration, therefore, may be established even now, albeit tentatively. That is to say, certain limited aspects may be offered to which all judgments relating to the problem can be referred, of course with the understanding that any gaps for which data are as yet wanting may be filled in from time to time as research progresses."

Procrusteanism, rather than operationism, seems to be the "watch-word of an austere empiricism." Without belaboring the question of priorities or the defining of frustration as a process, or even the implications of such Procrustean hypotheses, we present the cautions of Boring that a problem may become stale by the familiarity of the technical language currently used in its statement and solution, that a traditional problem often turns out to be specious when its defining operations are made explicit, and that we cannot assume that the phenomena observed in psychopathology are in any way to be construed as direct evidence of the operation of this, that or another variable.

It is curious that psychology must be so devious and wait on a majority vote. Precise formulations are available in the psychological literature—one needs only to re-read the chapters on learning. They are available also in the psychoanalytic literature and need no longer be extracted piecemeal, as it were, from the context of extensive clinical and popular writings. French (35), for example, defines and outlines orientations for investigation in his analysis of the goal concept as it is based upon study of *reactions to frustration*. The contributions of psychology and psychoanalysis should be *ap-posed*, not *opposed*, for, as French indicates, psychoanalysis' most important contribution to psychology is the demonstration that the psychological laws of rational behaviour apply also to irrational behaviour.

But psychology *rejects* the *methodology* of psychoanalysis as unscientific and hence, as equally unscientific, its theories and principles. Inextricably bound up with this rejection are charges of plagiarism and protests of psy-

choanalysis' indifference to or ignorance of psychology:—

Sears (74), after surveying the 'objective' studies of psychoanalytic concepts, concludes that, according to the criteria of physical sciences, psychoanalysis is not a 'good' science.

Bentley (15) pointedly reminds us that "Free association as a psychological method of research should not be confused with the context of the same term when used to denote the divinatory procedures of psychoanalysis," and, in exemplification, adds:

"The currency of this confusion is illustrated by the remark of F. Alexander that 'psychology, as an empirical science of personality, began with the discovery of the method of free association of Freud.' Everyone familiar with the history of the experimental study of memory and association knows that the method derives from Francis Galton and that it was described in 1879. Galton's object was 'to show how the whole of these associated ideas, though they are for the most part exceedingly fleeting and obscure, and barely cross the threshold of our consciousness, may be seized, dragged into daylight, and recorded.' His method was to allow 'the mind to play freely for a very brief time.' Besides measurable results, carefully described, there came out the emotive, the biographical 'unshared experiences,' the backward references to boyhood, and an intimation of the 'uncharted depths.' Add transference, mechanisms, and speculative theory—the objective and scientifically-minded Galton never would!—and you have Freudian 'analysis.' Before 1890 a whole series of laboratory studies of free associations had been carried out in England and Germany. Alexander finds that between 1890 and 1895 Freud . . . discovered the method of free association.' To him that hath!"

Heidbreider (49) asserts that although "Freud's career coincides in time with the rise and development of psychology as an experimental science," his work had the character of "not belonging" and insists further:

"Freud's indifference, furthermore, persisted throughout his career. It remained completely unaltered when psychology itself changed, partly by enlarging its field and including problems similar to his own. The mere suggestion that his attitude might have been otherwise is slightly absurd. It is interesting, nevertheless, as additional evidence of his extraordi-

nary absorption, that a whole new intellectual movement arose and developed in a field presumably related to his own, without arousing his curiosity or even attracting his serious attention." Evidently, the rejection, and so on arises because psychoanalysis can make capital of observations that psychology, with vested interests of a different sort, feels called upon to suppress by dictatorial decree.

At this point, we might interpolate a discussion of the distinctions between scientific temper and scientific techniques (*vide* Bertrand Russell and John Dewey). Instead we merely indicate that the technique, not the methods, of psychoanalysis is unique. Freud, himself, noted this distinction when he states that "the first bit"—turning the manifest dream into the latent dream—"comes under the heading of *dream interpretation*" and requires a technique; whereas the second "... showing how the latter becomes the former in the mental life of the dreamer ..." is a theoretical problem. The technique is scientifically and methodologically adapted to the exigencies of the therapeutic situation and to the complexity of the clinical data (*vide* French). The methods, referred to above as the "mechanics" of the interpersonal situation, are varied accordingly. If one recalls the psychological experiments of "active" and "passive" attitudes or of reaction times and the consciousness or unconsciousness of deception, it will be readily seen that mechanics such as the "couch" position and the "vis-à-vis" are not unique. Failure to distinguish between scientific temper and scientific technique has led many psychologists to duplicate the mechanics as synonymous with the technique. This accounts, in part, for the pitfalls which, for example, directive and non-directive psychotherapies in counseling have encountered.

We indicate further that from Freud and Ferenczi (and Jung) to the present day psychoanalysts have not ignored—as Heidbreider insists Freud has—"imagery and association, memory and emotion,"—"processes of vital importance to the Freudian theories and to the success of psychoanalytic therapy," or "the relationship between cognitive activities and the primal urges." Freud, as late as 1933, expressed his regrets that he did not have the time to acquaint himself with all that had been added to the field of mental science since his first

attempts; he stressed anew that his first intention—and for a long time his only intention—was to understand the disturbances of the human mind and thus he early recognized that "nothing that man makes or does can be understood without the aid of psychology." Space does not permit even mention of other evidences of psychoanalysis' interest in psychology. We call attention, however, to French's (37) contributions to the psychology of learning—the longest and most difficult chapter in psychology and to Flügel's (31) assertion that "the contributions of psychoanalysis to psychology far exceeded those to medical practices."

Somehow, psychology's rejections—stated with varying degrees of triviality and profundity—call to mind the preacher who was, at first, affronted when Mark Twain said that he had at home a book which contained every word of his sermon, then slightly relieved, but still unflattered, when Mark Twain added: "Webster's dictionary."

Psychology's attitude may be partially condoned. Psychoanalysis has experienced three main phases in its development. At first, interest was centered chiefly upon the id. Then came a phase of emphasis on the super-ego. Only recently has it entered upon a phase of emphasis on the functions of the ego. It has been difficult enough for psychoanalysis to keep pace with itself how much more difficult for psychology and how much more confusing now that psychoanalysis is concentrating upon what psychology so foolishly abandoned a long time ago! Moreover, there are discontents even in psychopathology—Glover, for example, notes that there are many who 'hanker after' the fictional normal-abnormal antithesis and a grounding in pure or normal (academic) psychology (41), but that the extent of this desire is in inverse ratio to the amount of positive theory they have been able to evolve from clinical observations, and Schilder (72) notes that psychoanalysis mistakenly feels the need of corroboration from Pavlov's field.

The *defections* of psychology have been purposely exaggerated here in order to indicate the evaluative preconceptions which impede its becoming familiar with the concepts of psychiatry and/or psychoanalytic psychiatry—and which thus impede a more intimate rapprochement. It has been suggested before that *appo-*

sion not opposition be the orientation for rapprochement. It is now suggested that they serve as the orientation for the formulation of problems and the organization of data within a psychiatric-psychologic-psychanalytic frame-of-reference. Some of the inviolability of the evaluative preconceptions will disappear as psychology finds itself on familiar ground and among familiar faces and thus not compelled to ignore and escape its own history.

Significantly, this orientation brings into sharp relief a large number of important contributions heretofore obscured in the profile view. Passing mention is given to only a very few:—

Vernon's (79) study of the relation of cognition and phantasy which employed tests of perception and immediate recall to delineate the differences between intelligently directed imagination and phantasy-motivated intelligence on the basis of the performances of school and 'clinic' children.

Cohen's (22) study of the relations of imagery to schizophrenic symptoms which used a modification of a 'classical' questionnaire and had its ultimate inception in the work of Fechner and Galton.

Zucker and Hubert's (90) study of the changes in function found in schizophrenic thought disorders which brought "the problem of schizophrenia, so far as is possible" . . . "into relation with the assumptions which have resulted from the experiments of Beringer and Ruffin in the analysis of function,"—a point of view (figure-ground) introduced into psychopathology by Goldstein, but probably anticipated in the psychologies of Ach and Brentano.

Israeli's (55) studies of the psychology and psychopathology of time-space perception which were derived from his earlier experimental studies of estimation of short time intervals and which bear the imprint of Dodge and Wiersma and Fechner and Wundt as well. Gardner Murphy calls our attention to the importance of these studies for social psychology. Studies of time-space perceptions have so many implications for further research that it is not irrelevant to note French's comment in a review of Thurstone's *Primary Mental Abilities*: "Apparently paradoxical findings such as the discovery of a large S (spatial) factor in a test on sound groupings may even suggest questions that may

lead to the discovery of unsuspected relations." Less clear, but equally pertinent, is Isakower's (54) thesis regarding the 'exceptional place' of the auditory 'sphere': The human being's need for orientation is met by speech, which also is based upon material taken in from the outer world, through auditory 'incorporation', here it is not so much the verbal elements themselves as "the assimilation and correct combination of visual images." And to the time-space perception 'syndrome' Wallenberg (84), hypothesizing from the experiments of Fischer, adds perception of movement (*vide Psychology and Language*).

Space does not permit elaboration of the ways in which imagination is embraced in French's concept of the organization of behaviour for wish-fulfilment. To give texture to the suggestion of the chapters on imagination as the orientation, we refer the reader to Carr's *Text-book* and to Spearman's *The Abilities of Man*. In addition we offer the following:—

Waelder (81) proceeds from the investigations of Head and Goldstein (and Kohler) to demonstrate that aphasias, psychoses, and neuroses may be differentiated in terms of the area in which imagination is disturbed. The world of the aphasic, for example, extends no further than the horizon of his immediate perception; he has lost the category of the 'possible'; his existence is confined to the actual environment at a given moment and to what his vital needs turn his attention to. Thus his freedom of action is spatially, temporally, and attitudinally limited. It is this feature which renders aphasias more amenable to investigation and leads to a greater precision of prediction as to his future behaviour. Goldstein (43) subscribes to this view and it is not surprising to find him stating confidently that "we have progressed so far toward constructing the total picture of the patient that we can predict with relatively great certainty how he will behave in any situation, even in respect to tasks which we have not yet examined." In fact, Goldstein's formulations regarding the disturbance in imagination anticipated Waelder's. The world of the psychotic, in contrast, has no horizons; he cannot escape the accidentals of a given situation and thus for him everything is possible; all these 'possibles' are terrifying—at first he tries to 'prove' that they are 'real,' thereby increasing

the fears, and ultimately may seek refuge in 'escape from reality.' His freedom is thus less limited than that of the aphasic, but experimentation with him is correspondingly more difficult. The neurotic's, and the normal's, conception of the 'possible' is overly realistically oriented and too much dictated by the coercion of the past which is betrayed in devious ways and intimated in wit, dreams, and lapsus linguae. His freedom is limited in proportion to the magnitude, and concentration in a level of psychological development, of the coercion of the past. Needless to note that, in research and clinically, he is more of a dark-horse than the aphasic or the schizophrenic or even the child.

Reik (70) demonstrates the ways in which imagination is differentially expressed and organized in the neuroses. His observation on neurotic camouflage and thought rehearsal may have bearing upon the elucidation of the psychological content and function of the primary mental abilities, notably V, W, and R: "The forces of intellect are enlisted to such an extent in the highly and ingeniously complicated way in which the obsessional patient weaves his ritual into the texture of reality situations that one can not conceive of a dullard remotely achieving the adroit 'stage management' required for the camouflage."

Another writer suggests that eidetic imagery may play an important role in obsessional acts and ceremonies. Forsyth (32) notes that the capacity of the child for projecting vivid 'mental' images, especially in the dark and when alone, is one of the most important reasons for the almost universal childish fear of the dark; this suggests an explanation of the reactions of young children to the Rorschach stimuli. Eidetic imagery may play a role in 'hypnotizability,' which has been frequently investigated by the Rorschach method. Kluever's (62) studies are significant in this context as suggested in the following excerpt:

"We recall that in eidetic images and certain other phenomena we find translocation of objects or transfer of certain characteristics of these objects or transfer of certain characteristics of these objects, fusions, and composite formations, substitutions, the appearance of parts instead of wholes, the nonappearance or the belated appearance of objects or parts of objects, reversals of right and left, up and down, or of

other direction. In other words, we find condensation, displacement, and other mechanisms that have been considered typical of dream formation. In eidetic individuals, similar changes may occasionally appear in the perception of real objects and thus become more easily amenable to an experimental approach. From various studies, it is evident that phenomenal properties of objects, visuo-spatial factors, and motor factors play a great role in effecting condensations, displacements, and similar changes in eidetic imagery. *This suggests the possibility that the changes in dreams such as condensations and displacements, frequently result from an operation of the same visuo-spatial, motor, etc. factors.*"

Bally elaborates upon the ways in which psychoanalytic theories and principles acquire new illumination from Jaensch's experiments and theories. "Under the influence of the transference situation," for example, "the patient returns to the eidetic level of experience and through the vivid pictorial recall of early infantile experiences under more favorable conditions, the ego is able to so alter the super-ego that command of the personality is gained and adaptation to reality attained."

Other trends such as those revealed in a series of lectures on imagination, including one by Gerard on the bio-physical basis of imagination, suggest the fruitfulness of this orientation for a fusion of psychiatry, psychoanalysis, and psychology. However, the issues so hotly contested by psychology are apt to be terminologically camouflaged unless it heeds and extends the cautions which Thurstone (78) points out in an article on Current Issues in Factor Analysis:—

"The investigator who wants to use factor methods must be competent in the science whose problems he wants to solve." "My own contributions to factor analysis have been motivated by a desire to solve some fundamental problems in psychology, and consequently I have tried to discourage a tendency to regard the factor method as a self-contained and extraneous statistical procedure. Its logic must be dictated by the nature of the scientific problems which it is intended to solve."

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PSYCHOPHYSICS.—Psychophysics is that branch of psychology which deals with measurement in the subjective or experiential continuum. It deals with two large classes of problems, namely, those which are concerned with liminal or subliminal differences between stimuli that can barely be differentiated and those which are concerned with supraliminal differences between stimuli which are judged as to their degrees of dissimilarity. The objects which are so studied are called psychological objects, which may be any persons, ideas, symbols, or things about which the subject can judge that "A is x er than B" where x is any designated attribute. The attribute about which the subject makes his judgment may be called the primary attribute while other attributes that are not explicitly judged may be called secondary. The physical stimulus continuum is defined by a series of stimuli that differ sequentially in some specified attribute. A corresponding subjective or experiential continuum is defined by the sequential qualities or processes by which the physical stimuli are experienced and overtly differentiated. For any given modality the dimensionality of the subjective continuum is equal to the number of independently differentiable attributes in the adequate stimulus continuum.

Historically, psychophysics has been concerned with several relatively simple problems, namely, the experimental study of liminal differences and Weber's law, the experimental study of supraliminal differences and Fechner's law, and with experimental methods of limen determinations which describe the sensitivity of the subject.

WEBER'S LAW

One of the central problems in classical psychophysics is concerned with the experimental and analytical methods of estimating the limen of a subject. This is a physical measure of the smallest stimulus increment that he can perceive. Weber's law is frequently stated in the form $\Delta I/I = k$, where ΔI is the smallest perceptible stimulus increment, I is the stimulus magnitude in some primary attribute, and k is a constant. This common formulation of Weber's law cannot be operationally interpreted without introducing ambiguities. When the subject discriminates, he does so in differentiating two stimuli. In a limiting case, where

the threshold is the object of study, one of these magnitudes is zero, but this case is not usually of importance for the experimental verification of Weber's law. The law should specify something about the subject's discrimination between two stimuli whose magnitudes should be explicitly denoted. Further, the subject fluctuates in his ability to discriminate. Hence we should state Weber's law by specifying the relative frequency of correct discrimination which shall constitute acceptable performance. Restating Weber's idea in experimentally meaningful terms we can write it in the form $P_R >_{kr} = c$ where R and kR are the two stimulus magnitudes which are presented for discrimination, k and c are constants, and P is a proportion. A revised statement of the law then declares that the proportion of correct discriminations between R and kR is a constant for different values of R . Weber's ratio is then $(1-k)$ if the constancy of c can be shown experimentally.

Weber's law can be verified for a variety of stimuli but it has definite limitations. It is not verified near the threshold; nor is it verified for high magnitudes approaching the terminal values. Weber's law is further limited to stimulus series in which the stimuli are of uniform discriminational dispersion (defined below). It has frequently been assumed that equally often noticed differences are subjectively or psychologically equal, but this theorem is also limited to stimuli of uniform dispersion. A set of stimuli can be so constructed as to satisfy Fechner's law but not Weber's law. This can be done because Fechner's law is not affected by variation in discriminational dispersion whereas Weber's law is so affected.

FECHNER'S LAW

Another large section of traditional psychophysics has been concerned with the relation between the physical stimulus magnitude and the corresponding subjective or discriminational continuum. In order to make this comparison each stimulus magnitude must be allocated to the discriminational continuum. A simple and direct method is to present the subject with two stimuli and to ask him to produce or select a third stimulus which seems to him to be experientially midway between the two given stimuli. This is the method of mean gradation. The three stimuli are then considered to be equidistant on the discriminational continuum and their physical

magnitudes can be determined. The subjective magnitudes of the stimuli are denoted S and their physical magnitudes are denoted R (from the German word *Reiz* = stimulus). It has been found that when S is plotted against R , the relation is usually logarithmic and hence it is described by the equation $S = k \log R$ which is known as Fechner's law. In this equation k is constant. The origin for the subjective scale S is the scale value of a stimulus of unit magnitude $R = 1$. Hence negative values of the S scale represent stimuli whose magnitudes are less than the physical unit chosen.

In psychophysical experiments it is desirable for the subject to judge the experienced magnitude of the stimulus as distinguished from estimation of the physical magnitude of the stimulus. A grocery clerk who has practice in estimating the weights of packages might find it difficult to serve as a subject in a psychophysical experiment in the stimulus range with which he is familiar. To the extent that the subject is estimating physical magnitudes instead of comparing subjective qualities, he commits what Titchener called the stimulus error. Some students of psychophysics have been concerned about this problem.

PSYCHOPHYSICAL METHODS

In most psychophysical problems the two stimuli to be compared are presented either simultaneously in different parts of the sensory field or successively in the same part of the sensory field. In either case there is the possibility of a constant error which can be classified as a space error or a time error.

The greater part of the older psychophysical literature was devoted to limen determinations. A limen is that stimulus magnitude which the subject is just able to perceive. A difference limen is that stimulus difference which the subject is just able to perceive.

The most complete and fundamental of the psychophysical methods is the *method of paired comparison* in which each stimulus is compared with every stimulus. If there are n stimuli in the series, there will be n^2 comparisons in a complete schedule of presentations. If the stimuli are of such a nature that the identity of a stimulus is easily recognized by the subject, then it cannot be compared with itself and there remain $n(n-1)$ comparisons. If complete counterbalanced order is not retained, then only one

of the two permutations jk and kj is used, and there are then $n(n-1)/2$ different paired presentations to the subject.

Because of the labor of presenting a set of n stimuli in all possible pairs, the procedure is frequently simplified by using only one stimulus as a standard. This standard stimulus is compared with all of the other stimuli and this makes a total of n or $(n-1)$ paired presentations to the subject. This simplified procedure is all that is required when the only purpose of the experiment is to determine somebody's limen at the stimulus magnitude of the standard. This procedure is called the *constant method* which is a special case of the more complete method of paired comparison.

In all psychophysical experiments in which two stimuli are presented to the subject for comparison, the experimenter must decide whether to give the subject two or three categories of judgment. If only two categories of judgment are allowed these are $j > k$ and $j < k$. If the two stimuli seem to the subject to be equal, he is not allowed to say so. The subject is requested to make a definite judgment as to which of the two stimuli is the greater in the primary attribute even if the judgment is a guess. If the subject is allowed three categories of judgment he has the privilege of giving one of three judgments, namely, $j > k$, $j < k$, $j = k$. There is frequent confusion as to when the intermediate category of judgment is to be allowed. The decision depends on the purpose of the experiment. If the purpose is to determine the subject's limen, i.e., his ability to discriminate, then only two categories should be allowed even if the two stimuli seem to him to be equal. If the purpose is to allocate each of the stimuli to the subjective continuum, then only two categories should be allowed. If, on the other hand, the purpose is to study the experience of equality, then the intermediate category should of course be admitted and even encouraged. The reason for this restriction is that some subjects require a high standard of certainty before they deviate from the equality judgment whereas other subjects with different temperaments will readily make assertions about the stimulus differences when these are slight and uncertain. The use of the intermediate category of judgment confuses the limen determination by introducing temperamental characteristics in what is fundamentally a problem

of sensitivity and discriminatory ability. It has been shown experimentally that the proportion of judgments $p_i > s$ is a continuous function of R_i for a given standard R_s even when the range is very small. The proportion of correct judgments is higher than chance even when the subject says that he is merely guessing. The intermediate category could be used in the study of temperament but that possibility has not yet been adequately explored.

Another psychophysical method is the *method of limits* in which pairs of stimuli are presented. One of these is always the standard stimulus. The variable stimulus is presented first at a very low value and its magnitude is augmented in steps for the successive presentations. At first the subject reports $j < k$ where j is the variable stimulus and k is the standard. When the variable comes close to the standard the subject shifts to the judgment $j = k$. When the variable stimulus has been raised to a higher magnitude the subject changes to the judgment $j > k$. The value of the variable stimulus is noted at each shift in judgment. The same procedure is followed for a descending variable stimulus, starting with a magnitude well above the standard. In this manner there are determined four limens, namely, lower ascending, upper ascending, upper descending, and lower descending. Because of a lag in the change from one category to the next, it is characteristic that the two ascending limens are higher than the descending limens and the lag can itself be an object of study with possible relations to the temperament of the subject. The several limens obtained by the method of limits are usually pooled into a single average limen for the subject.

The method of *mean gradation* consists in asking the subject to find a stimulus which seems to him to be midway between two presented stimuli. This method differs fundamentally from the previous methods in that we are here dealing with supraliminal stimulus differences whereas in the previous methods the presented stimuli differ mostly subliminally. When the method of mean gradation is extended to a larger number of steps, it becomes the *method of equal appearing intervals*. Here the subject is asked to assign a number of stimuli to a set of intervals in such a manner that the intervals seem to him to be equal. It can be shown experimentally that the subject usually fails to accomplish these instructions so that the inter-

vals at the ends of the scale are subjectively larger than the intervals in the middle range. The instructions can be altered so that the stimuli are sorted into a set of successive intervals without restriction that the intervals shall seem equal to the subject. This is the *method of successive intervals* in which each interval may be denoted by a sample stimulus or by a descriptive phrase, depending on the nature of the material to be discriminated. A limiting case is the *method of single stimuli* in which a descriptive phrase is given to each stimulus without a perceptually available standard. Another method is that in which the subjects are asked to place the stimuli in *rank order*. From the rank orders by a group of subjects, it is possible to compute the proportions $p_i > s$ and these in turn give the scale values of the stimuli as in the fundamental method of paired comparison.

The *method of reproduction* is perhaps the simplest method. Here the subject merely tries to reproduce a given standard stimulus. The absolute error is measured for each attempt and an average error of observation can be computed.

THE PSYCHOMETRIC FUNCTION

In making limen determinations by the constant method, the data are expressed in the form $p_i > s$ where j denotes variable stimulus and k denotes the standard. These proportions are plotted against the variable magnitudes R_i and the result is a sigmoid curve which is asymptotic to the base line at the left and to the value $p = 1$ for high values of R_i . This curve is known as the psychometric curve. A number of numerical determinations can be made from this curve. For example, the constant error is the stimulus increment between the value of the standard R_s and the value of R_i at the ordinate $p = .50$. If the stimuli are subject to an illusion, then the constant error measures the amount of this illusion in terms of the physical scale of stimulus magnitudes. The limen is, similarly, a physical measurement which may be defined as that stimulus difference which the subject differentiates in, say, 75 per cent of his attempts. Related measurements can be derived from the psychometric curve such as the interval of uncertainty, the point of subjective equality, the upper and the lower limens.

Much attention has been given to the problem of curve fitting for the psychometric function but these attempts represent usually nothing but empirical equations. At one time it was found that $\arctan \Phi$ gave a good fit but the probability integral has been found preferable. It has been named the *phi-gamma hypothesis*. This is merely the well known S-shaped curve of cumulative frequencies for a Gaussian distribution and it can be fitted by the procedures that are conventional in statistics. It can be shown that if Weber's law holds, or any other law according to which the limen is some monotonic increasing function of the stimulus magnitudes, then the psychometric function must be positively skewed. Since it is a universally admitted fact that for most kinds of discrimination the limen is covariant with the stimulus magnitude, it is impossible for the psychometric function to be symmetric as required by the phi-gamma hypothesis. The reason why the positive skewness of the psychometric function was not discovered in early studies was that they were concerned with relatively fine discriminations where the skewness was not noticeable. For coarse discrimination the positive skewness of the psychometric curve becomes conspicuous. Recent studies by Bekey and by Stevens have demonstrated linear psychometric functions for discriminations of relatively simple attributes, such as pitch and loudness, which sustain a quantum hypothesis in discrimination. For discrimination of stimuli where the primary attribute is itself physiologically complex, it is likely that the psychometric function is S-shaped. It will usually be symmetric when $p_1 > 1$ is plotted against $\log R_1$.

EXTENSION OF PSYCHOPHYSICS TO SUBJECTIVE VALUES

The application of psychophysical methods to the problem of limen determinations has been one of the central themes of classical psychophysics. Its only reference to the psychical is the implication of a subjective increment that is just differentiable. The subjective continuum is implied in the methods that involve supraliminal comparisons as in the method of mean gradation and its variants. Classical psychophysics has been concerned with liminal differences in determination of limens and in the experimental verification of Weber's law and

with supraliminal differences in studies of Fechner's law. As long as psychophysics was thus limited in its range of psychological application it was a rather sterile part of psychological science and it has justly been so regarded by most students. The outlook for psychophysics changes entirely when we extend the subject to the differentiation between things that are more important, both scientifically and socially. We are then concerned with the projection of a stimulus series on the subjective continuum. Further, instead of limiting psychophysical studies to those stimuli for which there exists some physical measure of the attribute to be differentiated (length, weight, brightness) as in testing Fechner's law, the methods can be extended to the study of differentiation among psychological objects for which the primary attribute does not have any known physical measure. Psychophysical method must then supply criteria of internal consistency so as to satisfy the logical requirements of measurement as distinguished from rank order. The unit of measurement becomes then a subjective process.

Consider a set of stimuli which have been arranged in rank order according to some primary attribute. For illustrative purposes, let this attribute be physically measurable such as length or weight. The process by which the subject perceives a stimulus may be called the *discriminal process* for that stimulus on that occasion. A comparison of two stimuli will then be determined by the gradient between two discriminational processes. A stimulus is not always experienced by the same discriminational process which fluctuates from one moment to the next. That process by which a stimulus is most frequently experienced by a subject may be called the *modal discriminational process* for that stimulus. Each discriminational process may be similarly identified theoretically as the modal discriminational process for some stimulus. The discriminational processes may be considered completely unknown as to their physical or psychical nature. Let all the discriminational processes in terms of which a given stimulus is experienced be spaced on a subjective continuum in such a manner that their frequency of association with the given stimulus is Gaussian. Such a subjective scale is completely arbitrary if it is defined by only one stimulus. Let all of the discriminational processes be similarly allocated for a whole stimulus series. Then it becomes a question of

experimental fact whether the several scales are identical so that the proportion of judgments $p_i > s_i$ agree with the theoretically expected proportions. Each stimulus is then defined in terms of two parameters for the subjective continuum, namely, its scale value which is the scale position of its modal discriminial process, and the standard deviation of the dispersion which each stimulus projects on the subjective or experiential continuum. The standard deviation of the projection of a standard stimulus may be defined as the unit of measurement for the whole stimulus series. This may be called the *discriminal error*.

This formulation of the problem leads to the law of comparative judgment which in its complete form is

$$S_1 - S_2 = x_{12} \sqrt{\sigma_1^2 + \sigma_2^2 - 2r_{12}\sigma_1\sigma_2}$$

in which S_1 and S_2 are the subjective or experiential scale values of the two stimuli as to the attribute by which they are compared, σ_1 and σ_2 are their respective discriminial standard errors, and r is the correlation between the discriminial deviations of the two stimuli. The value x_{12} is determined from the probability tables by the experimentally observed value of p_{12} , which is the proportion of the subjects who judge that $1 > 2$ in the primary attribute, or the same proportion for repeated trials by one subject. If the two stimuli are not subject to contrast effects or similar disturbances, the correlational term vanishes and the law then takes the simpler form

$$S_1 - S_2 = x_{12} \sqrt{\sigma_1^2 + \sigma_2^2}$$

This law expresses a relation between the scale values, the dispersions, and the experimentally determined values of x_{12} . The check for internal consistency is in extensions of the principle that the experimentally observed separation ($S_1 - S_3$) must equal the sum of the two experimentally observed separations ($S_1 - S_2$) and ($S_2 - S_3$). The experimental verification of this law does not depend on the physical measurement of the stimuli and it is therefore applicable in the measurement of values that have no known physically measurable counterpart.

The extension of the psychophysical methods with the law of comparative judgment and the appraisal of scale values as well as subjective

dispersions makes it possible to extend quantitative studies that are truly psychological to a great variety of problems. These include the laboratory measurement of discrimination of complex stimuli as, for example, the comparison of noises as to their pitch. Social attitudes of individuals or groups of subjects can be studied quantitatively before and after propaganda without any physical measurement of the propaganda stimuli. Moral values are similarly the subject of quantitative investigation such as the comparison of seriousness of crimes. International attitudes can be studied in several variant forms by psychophysical methods. International attitudes have been studied by these methods in the analysis of newspaper editorials over a period of years. When the scale values and dispersions are known, we can make predictions about the number of subjects who will choose any designated psychological object as their first choice. These theorems have application in the prediction of political elections and in studying consumer preferences to predict sales. In experimental aesthetics the new psychophysical methods have another application so that aesthetic theory can be brought into the laboratory for quantitative study. If the designated attribute is itself ambiguous and not rigorously defined, the psychophysical methods enable us to study the variation in connotation of a symbol in any particular group of subjects. The new methods are therefore applicable in semantic studies. Extensions of these methods have been made that enable us to define experimentally the zero point in an affective continuum where positive values represent appetition and negative values represent aversion. The utility concept in economics is similarly measurable by psychophysical methods.

The psychophysical methods are applicable to any set of psychological objects which may be persons, ideas, or things, about which the subject can make the comparative judgment that one psychological object exceeds another such object as to any designated attribute.

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PSYCHOSES,* THE.—The term “insanity” or “psychosis” is ill-defined, amorphous in meaning, and of little practical value. It is primarily a social term. The definitions vary according to: (1) the lay opinion, (2) the legal definition, and (3) the medical concept.

The lay definition is particularly vague, varying with the person using the term and with the situation. In general, society holds as “insane” those actions which are markedly inappropriate to the situation. The concept of “appropriateness” (cf. Latin *proprius*, proper) will vary with the time and locale; and men will mockingly and half seriously accuse as “being crazy” anyone who deviates from customary social practice. When the inappropriate action is occasional and without understandable emotional basis, the involved person may be termed “queer” or “eccentric.” When the inappropriate response is constant or exaggerated, the lay diagnosis of insanity is made. In a primitive society which believes in witchcraft and “voodoo,” one who sees ghosts or who has visions of spirits is not considered “insane” because his responses are “appropriate”; in a modern, highly organized social unit, such a person would be made the subject of psychiatric examination. History shows countless examples of such men as Pasteur, Fulton, and the Wright brothers, whose assertions were regarded as so out of keeping with “normal” and “customary” experiences as to be labeled as “madness.” In other words, any action or any person who is too “different” from the accepted pattern is considered “insane.”

The legal definition of insanity in the United States is archaic and without basis either in terms of customary social definition or in terms of scientific knowledge. In many law courts of the United States, the test of insanity is whether a person knows the nature and quality of an act and knows whether it is wrong; that is, whether he can distinguish right from wrong. In some states, a further qualification is added that to be sane a man must be able to refrain from doing that which is wrong, and have the capacity to resist an impulse.

These legal definitions have resulted in unjust verdicts and sentences. Feeble-minded persons are not “insane,” yet often fail to distinguish between “right” and “wrong.” Many normal

persons in certain situations cannot make such a distinction; while, on the other hand, many obviously psychotic patients can verbally make this legal distinction. The terms right and wrong are, in themselves, so vague in definition as to render the test invalid.

Furthermore, many so-called nervous persons (psychoneurotic) are so subject to compulsions that they are “unable to refrain” from doing “wrong.” Even normal persons may, under the influence of “normal” anger, commit acts which they know are wrong, and for which only technically can they be termed as insane.

In consequence, the legal definition of insanity in the United States is valueless, and should be replaced by the more scientific, medical concepts of cause or of disease pattern.

The medical definition of the psychoses is a generic one, and includes a number of relatively unrelated disease processes. The “psychoses” (Gr. psych, soul; and osis, disease) cannot in many cases be sharply differentiated from the psychoneuroses, from psychopathic personality reactions, or even at times from normal responses. From a medical aspect, the term psychosis acquires specific meaning only when defined as a serious personality disorder of specific etiology or of definite pattern.

There are two main categories of psychoses: (1) the Organic Psychoses and (2) the Constitutional Psychoses. By definition, the organic psychoses result from physical disease of the brain and are evidenced primarily by disturbance in intellectual ability. The constitutional psychoses are, according to the consensus of psychiatric authorities today, on a constitutional basis and are subdivided into two widely different personality patterns: (a) the manic-depressive psychoses which are primarily disturbances of mood, and (b) the schizophrenic psychoses, which are primarily disturbances in the associative processes of thinking. These psychotic patterns differ widely in their symptomatology.

In consequence, it may be said that there is no sharply definable entity, “the psychoses.” Instead there are several types or kinds of personality response which, to be clearly conceived, must be labeled in accordance with their etiology or symptom-complex.

HISTORY

Our present concepts of the psychoses have been developed primarily since the 19th cen-

* Condensed from *The Therapy of the Neuroses and Psychoses*, Lea & Febiger, Philadelphia, 1943.

tury. Prior to that time not only was medical classification faulty, but the reaction of society to these patients was largely a matter of local superstitions. In many earlier societies, epileptic and psychotic patients were regarded as being possessed of the devil. Accordingly, they were burned at the stake, beaten to "drive the devil out," and otherwise tortured in the guise of therapeutics. Frequently such patients were regarded as dangerous and were confined by steel chains in dungeons, and they were mistreated by brutal and ignorant gaolers. In other times and lands, these patients were thought to be in possession of special attributes and abilities so that one could curry favor with the gods by propitiating the "madmen." For the most part, the average psychotic patient was not recognized as "being sick," and so when he could not be cared for at home was confined to the "poor house" or to jail. Medical care was rarely sought.

Gradually various institutions came into use for the exclusive care of these patients. Bethlehem Royal Hospital (Bedlam) in London (founded as a priory in 1247) was rebuilt as an asylum for the insane in 1676. In 1725 a Rhode Island (U. S.) law permitted towns to build houses of correction for vagrants and also for "mad persons." Custodial institutions opened elsewhere throughout the civilized world, the care being given these patients frequently varying with the financial means of the family. In the United States private institutions were opened (psychotic patients were admitted to Pennsylvania Hospital, 1752; the Hartford Retreat, 1824; Dexter Hospital, 1828; Butler Hospital for the Insane, 1847); and in 1773 (incorporated in 1768) at Williamsburg, Virginia, the first public institution, now the Eastern State Hospital, was opened for the insane. Conditions in the rest of this country did not improve for many decades; and the work of Dorothea Dix (1802-1887) in fostering the establishment of well-cared-for medical institutions marked a great forward step.

The medical concept of the disease developed gradually. Felix Platter (1602) described four types of mental disorders: (1) *mentis imbecilitas*, (2) *mentis consternatio*, (3) *mentis alienatio*, and (4) *mentis defatigatio*. T. Willis (1674) described "clinical entities" under the heading of stupidity and morosity. Late in the 18th century Philippe Pinel (acting against the

advice of his colleagues who warned him that he was taking his life in his hands, freed patients from the heavy chains which bound them in their stone cellars), stimulated the medical world to a newer and more humane concept of this illness. The French school tended to classify psychotic patients primarily into the degenerate and the non-degenerate groups, without any clear cut divisions of psychotic illness as we know them today. The English school grouped these patients into the "mania-excitement," and the "melancholia-depression" classifications which included many of the organic psychoses, and the schizophrenias. The German school evolved the concepts of *amentia* and *Wahnsinn* (Wahn, false; sinn, sense; i.e., acute, non-systematized delusional and hallucinatory states), paving the way for the Kraepelinian conceptions.

In 1863, Kahlbaum attempted to define specific medical entities and not merely give descriptions of psychologic syndromes. He advanced four large groups of disorders: (1) *vesania* (ve, not; sanus, sound), or general insanity, which had four stages ranging from melancholia, through mania and confusion, to dementia (cf. *dementia praecox*); (2) *vecordia* (i.e., wrong-heartedness), representing the "emotional" psychoses and much of the pattern today called the manic-depressive psychoses, but also including even the "monomanias" of the French school; (3) the *dysphrenias* (dys, ill; phrenia, mind) resulting from toxic-exhaustive disorders; and (4) the *paraphrenias* (para, distorted; phrenia, mind), or age-determined disorders, including the *neophrenias* of infancy, the *hebephrenias* of youth, and the *presbyophrenias* of old age. These concepts held sway for a while but did not stand the test of time.

In 1851, J. P. Falret had described "*la folie circulaire*" which later became our present manic-depressive psychoses; and E. Kraepelin in 1887 (further developed in subsequent editions of his text-book) formulated the present concept of *dementia praecox*. Bleuler later (1916) coined the term *schizophrenia* as a concept differing only slightly from Kraepelin's *dementia praecox*. Adolf Meyer (1922) views the psychoses not as disease entities but as reaction patterns to pluralistic causes.

This evolution of psychiatry from the initial purely descriptive levels, then as a definition of symptom complexes in terms of prognosis, and

finally to the delineation of syndromes which show a unity of cause, course, and conclusion has still not reached the final stage. The work of Freud has done much to help us understand the psychologic mechanisms, but we are only in the initial phases of understanding the etiologic mechanisms of the "constitutional" psychoses.

THE ORGANIC PSYCHOSES

The organic psychoses, though of varying etiologies, have one factor in common: a physical disturbance of the cerebral cortex. The symptoms of these psychoses result not from the specific nature of the cause; for many dif-

ferent conditions can similarly disturb the functions of the cortex. Hence, the psychotic symptoms of such widely varying diseases as senile dementia, general paresis of the insane, and alcoholic psychosis are essentially the same, the differences lying primarily in the physical signs. The psychotic symptoms fall into two categories: intellectual symptoms and personal-ity changes.

The pathology of the organic psychoses is (1) always present in the cerebral cortex, and (2) is diffuse in its involvement. There are many instances wherein the subcortex has been injured or diseased without any resultant impairment of "mental faculties." Thus apoplexy,

CHART NO. I

Movement of Patient Population in State, Veterans', County and City, and Private Hospitals for Mental Disease, by Type of Control of Hospital: 1941

Movement of Patients	All Patients			Private Hospitals	Percent of All Patients			
	Total	Male	Female		State	Vet- erans	County & City	Private
Patients on books at beginning of year	542,477	292,345	250,132	11,406	85.8	5.8	6.3	2.1
In hospital	480,741	259,616	221,125	10,588	85.1	6.2	6.5	2.2
In family care ¹	1,175	427	748	....	100.0	..	..	..
On parole or otherwise absent	60,561	32,302	28,259	818	90.9	2.6	5.1	1.4
Admissions during year ..	160,202	92,915	67,287	26,174	70.7	7.0	6.0	16.3
First admissions	113,181	64,505	48,676	16,692	74.4	4.7	6.2	14.7
Readmissions	38,153	22,932	15,221	8,544	62.2	10.7	4.8	22.4
Transfers from other hospitals for mental disease	8,868	5,478	3,390	938	60.5	20.4	8.5	10.6
Separations during year ..	146,301	87,081	59,220	25,604	69.3	7.2	6.1	17.5
Discharges	97,892	59,011	38,881	22,428	63.2	8.8	5.0	22.9
From hospital	51,630	33,945	17,685	21,086	40.5	13.4	5.3	40.8
While on parole	46,262	25,066	21,196	1,342	88.6	3.8	4.7	2.9
Transfers to other hospitals for mental disease	8,809	5,032	3,777	1,684	60.9	5.4	14.6	19.1
Deaths in hospital	38,807	22,577	16,230	1,473	86.1	3.5	6.7	3.8
Deaths while on parole or otherwise absent ..	793	461	332	19	84.4	4.3	9.0	2.4
Patients on books at end of year	556,378	298,179	258,199	11,976	85.8	5.8	6.3	2.2
In hospital	490,506	263,642	226,864	10,936	85.1	6.2	6.5	2.2
In family care ¹	2,043	743	1,300	....	100.0	..	..	..
On parole or otherwise absent	63,829	33,794	30,035	1,040	90.7	2.9	4.8	1.6

¹ Only State hospitals were requested to report the number of patients "In family care."

* Patients in Mental Institutions, 1941, U. S. Department of Commerce, Bureau of the Census.

CHART No. 2

First Admissions to State, Veterans', County and City, and Private Hospitals for Mental Disease,
by Type of Control of Hospital, by Mental Disorder: 1941 *

Mental Disorders	All First Admissions					
	Per Cent					
	Public Hospitals					
	Total	Total	State	Veterans	County & City	Private Hospitals
Total	113,181	100.0	100.0	100.0	100.0	100.0
With psychosis	97,288	86.0	88.5	58.5	89.1	80.8
General paresis	7,501	6.6	7.5	10.6	6.0	1.2
With other forms of syphilis of the C.N.S.	1,262	1.1	1.2	2.2	1.5	0.3
With epidemic encephalitis	324	0.3	0.3	0.3	0.2	0.2
With other infectious diseases	415	0.4	0.4	0.4	0.4	0.3
Alcoholic	5,319	4.7	4.5	6.0	6.1	4.7
Due to drugs and other exogenous poisons ..	688	0.6	0.5	0.4	0.5	1.3
Traumatic	573	0.5	0.5	0.9	0.5	0.4
With cerebral arteriosclerosis	13,441	11.9	13.7	5.0	9.6	5.9
With other disturbances of circulation	882	0.8	0.8	0.7	1.0	0.6
With convulsive disorders	1,791	1.6	1.8	1.3	1.4	0.4
Senile	9,781	8.6	9.2	0.8	12.7	6.8
Involuntary psychoses	4,707	4.2	3.9	1.7	2.2	7.1
Due to other metabolic, etc., diseases	1,204	1.1	1.1	0.4	1.7	0.9
Due to new growth	218	0.2	0.2	0.2	0.1	0.2
With organic changes of the nervous system ..	1,338	1.2	1.3	0.8	1.2	0.7
Psychoneuroses	4,606	4.1	3.2	3.0	2.6	9.2
Manic-depressive	10,551	9.3	8.4	4.0	8.5	15.8
Dementia praecox (schizophrenia)	22,155	19.6	21.0	12.0	16.9	16.1
Paranoia and paranoid conditions	1,923	1.7	1.5	0.3	2.3	2.7
With psychopathic personality	1,090	1.0	0.9	1.3	1.0	1.2
With mental deficiency	2,899	2.6	3.0	1.5	2.9	0.7
Other, undiagnosed, and unknown	4,620	4.1	3.6	4.6	10.0	4.1
Without psychosis	15,893	14.0	11.5	41.5	10.9	19.2
Epilepsy	510	0.5	0.4	0.6	0.6	0.5
Mental deficiency	1,647	1.5	1.7	1.2	1.4	0.4
Alcoholism	6,943	6.1	4.9	7.7	6.6	11.5
Drug addiction	703	0.6	0.4	0.5	0.5	1.8
Personality disorders due to epidemic encephalitis	84	0.1	0.1	0.1	0.1	0.1
Psychopathic personality	1,082	1.0	0.9	2.3	0.3	1.2
Primary behavior disorders	472	0.4	0.3	0.3	0.2	1.0
Other, unclassified, and unknown	4,452	3.9	2.8	28.6	1.3	2.7

* Patients in Mental Institutions, 1941, U. S. Department of Commerce, Bureau of the Census.

with hemorrhage in a large area of the sub-cortex, only rarely produces a psychosis. Parkinson's disease with deterioration of the basal brain ganglia is rarely associated with intellectual deterioration. When psychotic symptoms do result from such subcortical disturbances, they are usually secondary to retrograde nervous degeneration or to circulatory changes involving the cortex.

That to produce psychotic symptoms the organic pathology must involve rather large areas of the brain can be seen from the fact that local hemorrhages in the cerebral cortex, small cortical tumors, and even penetrating wounds of the skull do not produce a psychosis. The exact extent of the brain which must be involved before personality manifestations are produced is unknown, but it is established

large areas must be involved (cf. Lashley's experiments on "mass action" of the brain). There are, moreover, specific areas of the brain which, when disturbed, will give rise to special symptoms. Thus, an injured "speech area" may bring about aphasic symptoms, and injury to the "visual area" will produce an agnosia. On the other hand, injury to and even removal of large portions of the frontal lobes may leave the person with an intact and seemingly normal personality.

The disease processes which affect the brain fall into five categories: (a) toxic, (b) infectious, (c) degenerative, (d) traumatic, and (e) neoplastic. In some of these conditions, the brain is involved directly, as in the degenerative psychoses; while in others, the disease process may exist elsewhere in the body and involve the brain secondarily, as in the toxic state accompanying pneumonia. The symptoms of all the organic psychoses fall into three categories: (1) physical symptoms, (2) intellectual impairment, and (3) personality changes.

THE PHYSICAL SIGNS AND SYMPTOMS

The differentiation between the different types of organic psychoses must be made primarily upon the physical signs rather than on the mental changes. There may be such general changes in the body as are seen in the toxic states of pneumonia and other acute infectious diseases of the body. There may be such specific symptoms as alcohol on the breath in the alcoholic patient, or bromide in the blood of the patient with bromide delirium. There may be involvement of the physical nervous system as evidenced by the pupil and reflex changes in the general parietic patient. The senile-dementia patient will manifest all the signs of aging changes in the blood vessels, skin, muscle, etc. These physical changes due to the disease process are essentially the main evidences of the etiologic agent, and together with the history of the illness are the basis for specific diagnosis.

INTELLECTUAL IMPAIRMENT

Although we lack a precise definition of thought and its dynamics, it may be assumed that without the cerebral cortex, thought, as commonly understood, would be impossible. A corollary to this premise is that thought is most efficient in a "healthy" brain; and conversely, a

disturbance in the physical functioning of the brain is associated with an impairment in the efficiency of thinking.

The patient with an organic psychosis has primary disturbances, therefore, in his thinking process. This disturbance may be extremely mild, and detectable only by intimate associates of the patient, or may be gross and patent to the casual observer. The whole thought process is involved, with those functions of mentation requiring the greatest training being the first to suffer.

Although various intelligence tests may be used, the standard psychiatric practice is to examine the patient as to: (1) his memory for recent and remote events, (2) his orientation as to time, space, and persons, (3) his general information at the time of the illness in contrast with his knowledge before the illness, (4) his ability to calculate, in relation to his educational background, (5) his judgment as applied to standard test stories, or to current situations, and (6) his insight as to his deviation from normal behavior. The questions asked of the patient under each of these headings vary with his cooperativeness, his alertness, his span of attention, and his previous intellectual attainments. Thus the average grammar-school graduate would be asked to perform some simple addition; whereas the former college professor of mathematics would be given an algebraic problem. Any coexisting factor which influences the patient will alter the test responses. The purpose of such examination is to determine the fact and degree of loss of intellectual ability.

In the mild case of organic illness, the first observable changes of intellect occur in memory. The patient becomes somewhat forgetful, misplaces common and everyday objects, cannot recall names or dates, overlooks appointments. Judgment is not so keen as formerly, and decisions become hesitant. As the illness progresses, the memory becomes more and more faulty. The patient may forget what he wished to purchase at the store, he may be unable to recall what he had for breakfast, he may forget the name of the street on which he lives, he may not recall the names of his children or even whether he has any children. He may become confused in his actions and may be unable to dress himself, he may eat soup with a fork, or pick at his meal with his fingers.

Simultaneously, he deteriorates in his appearance and in social behavior.

These intellectual changes, varying from the almost undetectable to the extremely obvious confused state, are characteristic of the organic psychoses, and irrespective of the nature of the disease are the result of injury to the cerebral cortex.

PERSONALITY CHANGES

Although the personality is altered, *ipso facto*, with the deterioration of intellectual ability, an additional group of personality changes occur which result from the emergence of the underlying basic personality (cf. Hughlings Jackson's release of "lower" nervous centers with disease of "higher" centers). As indicated by Kretschmer, Jung, and others, there exist at the extremes of the distribution curve fairly definite personality types. Some persons are characteristically shy, sensitive, withdrawn, and, in Jungian terms, "introvert." At the opposite end of the scale, are those persons who are socially active, full of humor (or its counterpart, anger), aggressive, and "extrovert." Between these extremes are the vast majority of persons with combinations of these opposing (or rather antithetical) characteristics. In all persons, there is further modification of this "basic" personality by neurotic and psychopathic features.

Modification of behavior is possible by means of the cerebral cortex. In animals without the cerebral cortex, conditioned reflexes, the simplest forms of behavior, are almost impossible (cf. Pavlov). Because of his cerebral cortex, the human animal has been able to control, redirect, inhibit, and sublimate fundamental drives and reaction patterns. In those cases where the person's actions seem uncontrolled, as in psychoneurotic or psychopathic states, the responses, though unhealthy and immature, are nevertheless the product of cortically controlled psychologic dynamisms.

When there is a physical impairment of the cerebral cortex such as occurs in disease, there is a resultant disturbance in the function of that cortex. Hence, not only is there a loss of the intellectual powers of the cortex, but there is interference with the processes of inhibition, sublimation, and control of drives and reaction patterns. Those elements of the personality ordinarily held in check by cortical action will

then emerge. Rarely will they emerge in pure form because complete cortical control is lost only in coma or death, and because the basic reaction patterns have been modified over years of training; but the greater the degree of loss of cortical function, the greater the release (in the sense of Hughlings Jackson) of the basic personality.

Thus, the general parietic patient who has always been shy and sensitive, withdrawn and introvert, may present, in addition to the signs of intellectual damage, symptoms of schizophrenia. Another patient with general paresis may present signs of manic illness with overactivity, euphoria, grandioseness, and a flight of ideas. A third patient with this form of syphilis of the brain may be depressed, tearful, taciturn, and suicidal. A fourth patient suffering from the same disease, may present the personality symptoms of a neurotic, with hypochondriasis and symbolic complaints. In such case, the etiology has been the same, but the underlying personality has been different; hence there is a different form of personality response. The same principle holds true for all the organic psychoses. The differential diagnosis can be made primarily through the physical aspects (and clinical history) of the disease.

The etiology of the disease is relatively unimportant in the production of these "release" symptoms. The determining factors are the severity and diffuseness of the pathology, the amount of disturbance in the brain cells. Thus, the same amount and kind of intellectual loss, and the same personality symptoms may be present in a patient who suffers from general paresis, from chronic alcoholism, from bromide intoxication, or senile dementia. On the basis of the psychosis, and in the absence of knowledge of the physical status, one would find it almost impossible to make a differentiation between these various etiological agents.

Acute disease of the brain cells presents a different clinical picture from that produced by chronic disease. The relatively sudden and intense involvements of the brain tend to be short-lived; they are termed the Acute Deliria. The chronic diseases of the brain differ not only in that there is less intensity of irritation of the brain, but in that there is greater opportunity for the total personality to make readjustments to living. Accordingly there is a diminution in the intensity of symptoms de-

spite destruction of large amounts of brain tissue.

In the acute states, the patient seems much more ill physically, is more confused intellectually, is usually more fearful and emotional, and often has sense falsifications.

THE ACUTE PSYCHOSES (Acute Delirium)

Acute disturbances of the brain may occur as a result of such direct infection of the brain as meningitis or encephalitis, or as a result of toxins arising from an infection elsewhere in the body. There is relatively little, if any, difference between the psychotic symptoms of the various deliria, the determining factor lying not in the etiologic agent but in the extent and intensity of the pathology. There is also a second factor of "constitutional resistance," so that one patient with a given amount of cerebral pathology may manifest few symptoms; whereas a second patient, with the same amount of physical change in the brain, may be acutely delirious.

In mild cases, the only evidence of delirium may be transient, mild, and barely noticeable forgetfulness and irritability. In severe cases, there may be acute physical illness, intense confusion and disorientation, marked fearfulness, with shouting and uncontrolled activity, and eventually convulsions or coma. The average case occurs after some physical illness while the patient is in the hospital.

The patient at first seems weak and apathetic. Usually, the appearance is that of fever or exhaustion. Laboratory tests will often indicate a toxic or infectious state. The patient becomes more restless, the muscles jerking, or twitching, or moving about purposelessly. In severe illnesses, the patient will attempt to get out of bed and move about the room. Sometimes the struggle to get out of bed becomes acute, and it may be necessary physically to restrain the patient.

The patient's intellect suffers. A state of confusion supervenes, characterized primarily by lack of orientation and memory defect. At first the patient does not recognize the doctors or nurses, and then may not identify friends. Even the names of close relatives may be forgotten. The patient may not remember the day or the month or even the year. He may not know the name of the hospital, or know that he is in a hospital. He hears instructions and expla-

nations as if he were in a dream and then asks some question or makes some statement which indicates that he has not understood what was said. He is disinterested, and his attention is captured by passing stimuli, though only momentarily. His judgments are without value primarily because of the memory defect, but also because the highest developed intellectual functions, in this case the discriminatory ones, are the first to be involved in any brain disease. Formal tests indicate that his knowledge of general information is defective, and that his ability to calculate is poor.

The personality symptoms will vary with each patient. A state of fear is present in most patients. In the mild state, it may be easily alleviated by reassurance and a quiet, competent nurse. In acute instances, the fear may become intense, so that the patient is fearful of anyone who comes into the room, is fearful of the food that is given, is afraid of the medicine or the nursing attentions. Sometimes, actual panic states may develop, with the patient struggling violently in an effort to escape the room.

Other personality symptoms may occur depending upon the emotional state of the patient before the illness, and upon his basic personality. Some patients may have a manic reaction, with laughing, punning hilarity. Others may be depressed, crying, hopeless, and even suicidal. Some may become suspicious, and develop delusions and hallucinations as in the schizophrenic. Still others may become markedly hypochondriacal.

Illusions and hallucinations may develop in the acute psychotic reactions. The basis for these symptoms lies in at least two factors: an impaired apperception, secondary to the disturbance in the cerebral cortex; and a toxic stimulation of the sensory nerves. In the first instance, stimuli are not immediately and correctly identified, and are misinterpreted. Thus, a passing shadow may be interpreted as a stranger entering the room, or a waving curtain may appear as a burglar coming in the window. The stimuli are interpreted according to the gestalt of the person at the time, so that if a state of fear exists the stimulus will be interpreted accordingly.

The second factor in the production of illusions and hallucinations lies in the irritation of the sensory nerves by the circulating toxins. The nerves, thus stimulated, send impulses to

the cerebral cortex, and there are interpreted according to the degree of excitability of the brain cells and the existent gestalt. Such stimulation of the visual hallucinations is commonly seen in delirium tremens in acutely toxic states. If the auditory nerves are involved, mere "noises" may be heard if the toxic condition is mild; whereas voices of a terrifying and accusing nature will be heard if the disturbance is great. If the sensory nerves from the body are excited, there may be feelings of skin irritation "as if ants were crawling on the skin" or there may be sensations of "electricity." Such sense falsifications are much more common in the acute psychotic reactions than in the chronic ones.

THE CHRONIC PSYCHOSES

In this group of psychotic disturbances, the etiologic agent acts much more slowly than in the acute reactions, so that the symptoms usually require a much longer period of time for their full expression, and the personality has an opportunity for partial readjustment to the environment. The psychotic symptoms in this entire group depend primarily upon the pathology and site of involvement instead of on the etiology. Since the psychotic symptoms are so much the same in the various subgroups, only one disease process characteristic of each of the infectious, toxic, and degenerative classifications will be described. The psychoses associated with trauma (0.5 per cent of all first admissions) and neoplasm (0.2 per cent) are relatively infrequent and will not be described here.

GENERAL PARESIS

There are several types of syphilis of the brain, but only the meningoencephalitic form produces a psychosis. This form (known as general paresis because before the advent of modern therapy the patients became completely paralyzed in the end stages) is the result of an invasion of the cortex of the brain by the spirochete, *treponema pallida*. Until recent years about 8 per cent of all first admissions to mental hospitals were general paresics. The disease is found about five times as frequently among men as among women. It has been estimated that about 1 in every 200 syphilitic patients will develop this kind of infection of the brain. Usually, the mental symptoms do not manifest themselves till 15 to 25 years after the

initial infection so that the majority of are found in men over 40. However, there are cases where the new-born child may have congenital syphilis in which the brain is involved.

The disease process is so slow that chronic brain changes are found. The membranes about the brain are thickened; the brain shrinks to two-thirds its normal weight and size; the cerebral convolutions are shrunken, especially in the frontal area; and microscopically one finds many dead and dying ganglion cells. Scattered throughout the brain spirochetes are found.

The symptoms of general paresis may be described in three categories: (1) The physical signs are primarily those of neurological syphilis. The patient may appear in good health early in the disease, but will be wasted and pale later. He has headaches which shift in location. The pupils have the well-known Argyll-Robertson sign wherein the pupil of the eye is small, irregularly shaped, and will not react to light though it will react to accommodation. (That is, the pupils of the normal eye become smaller when light is thrown directly into them, and they will also become smaller when a person shifts his gaze from a far point to a near one.) There are tremors of most of the muscles, including those about the lips, the tongue, and the hands. Writing with pen and ink demonstrates marked tremulousness. As a result of disease of the cells which control the movements of the muscles of speech, the patient is often unable to pronounce words containing several syllables, such as "constitution," "rough riding artillery brigade," or "sinister similarities." Epileptic attacks may occur because of brain irritation. Aphasia may occur if the speech area of the brain is involved. In addition, signs of involvement of the spinal cord are present, manifesting themselves in disturbed reflexes, if mild; and in tabetic paralysis, if severe. Tests of the blood (Kahn and Wasserman) and of the spinal fluid (Lange gold curve), all show definite evidences of syphilis. If no treatment is given, paralysis of all muscles sets in and the patient may die of the slightest illness.

(2) Symptoms of intellectual deficiency are usually the first to make friends and relatives aware of the disease. Inasmuch as these symptoms develop over a period of years, the first signs of the illness are often overlooked. At first the patient is forgetful, not recalling the

names of his friends, forgetting his routine tasks, misplacing items, making appointments and then not remembering them. At the same time there is a defect in customary judgment, seen particularly in men who have responsible positions. The controlling influence of the cortex is diminished and cautiousness is succeeded by impulsiveness, snap judgments, impatient decisions. As the disease progresses, the memory changes become more marked and the patient becomes acutely bewildered in his own accustomed office or even home. He may forget what street he lives on, what day or even year it is, what the names of the members of his family are. He cannot perform the simplest additions or subtractions even in getting change from the corner store. He recalls nothing of the current events, and becomes completely confused about subjects concerning which he may previously have had the strongest of convictions.

(3) Personality disturbances occur simultaneously. Sometimes these changes are relatively mild and the patient will sit about showing no change other than apathy and loss of intelligence. In other instances, the personality changes produce a marked conflict with the environment. The cerebral cortex, having lost or having diminished directing power, has less control over the person's response to irritating situations. Consequently emotional responses become common, and violent outbursts occur over insignificant unpleasantnesses. For the same reason—that is, diminished control by the cortex—the slightest pleasures create enormous good humor, and whims of appetite are excessively indulged in. At least seven distinct psychiatric states may result, depending upon the basic personality and its modifications: (1) Simple dementia, wherein physical and intellectual signs predominate and where there is the mildest of personality disorder. (2) Manic or euphoric states with the patient extremely happy, full of greetings for everyone, expansive, and giving away millions of dollars or strings of pearls. (3) Depressive states wherein the patient will be unhappy, morose, silent, inactive, and suicidal. (4) Agitated depressions with the patient not only depressed but restless, full of anxiety and fears. (5) Schizophrenic states with the patient having many delusions and hallucinations, feeling persecuted and becoming withdrawn. (6) Psychopathic states wherein latent

sadistic tendencies may come to the fore, and (7) psychoneurotic types with many physiologic tension symptoms and multitudes of symbolic reactions.

These psychiatric states may occur partially or in full-fledged form. They may occur singly or in combinations. The entire emotional background of the patient furnishes material which may be woven into the existing psychiatric pattern. There is no single personality state which is characteristic of general paresis.

The treatment of this condition falls into two categories. The first is directed along anti-syphilitic lines, with the use of fever-producing agents (it is interesting that in tropical countries, where both syphilis and malaria are present, there are very few cases of general paresis—showing the effect of fever on this disease), arsenical, bismuth, and mercury drugs. Recently, penicillin has been reported as having a remarkable effect in clearing up syphilis. The second form of therapy is in the custodial or psychiatric care which is given concurrently with the medication. Sometimes electric shock therapy is necessary in addition to the anti-luetic measures.

Most investigators have found that under treatment one-third the patients recover, one-third the patients improve, and one-third the patients do not get well.

Other chronic infections of the brain will produce a similar symptom complex, depending on the intensity of the brain infection.

THE ALCOHOLIC PSYCHOSES

The alcoholic psychoses do not occur in all persons who are chronic alcoholics. There is a marked variation in individual tolerances to alcohol. Some persons can drink large quantities of alcohol without any permanent and with but mild transient effects, while others become acutely intoxicated with small amounts, and develop liver and brain degeneration relatively easily.

There are many degrees of alcoholic psychosis. From a technical aspect, drunkenness is an acute but brief alcoholic psychosis. It is temporary and reversible, but nevertheless its symptoms are similar to those of the delirium of a pneumonia, or the psychosis of bromide intoxication. In such cases, the alcohol reaches the brain cells and decreases their ability to function. (One must consider separately the influ-

ence of small amounts of alcohol in releasing inhibitions and permitting an increased output of energy and emotion.) The physical symptoms of thick tongue, staggering gait, etc., are familiar. The intellectual symptoms are proportionate to the amount of cortical involvement: the memory is impaired, and actions may be performed about which there will be no recollection on the next day. Judgment is interfered with, and the entire sensorium performs at a lower level of efficiency. Here again the personality symptoms vary according to the underlying personality and the emotional state of the person. Thus some persons become excessively good-humored and extremely loquacious when intoxicated; others become suspicious, sullen, morose and ready to "pick a fight"; still others begin weeping and reciting all their miseries; and so on.

If enough alcohol is taken and the person is susceptible, coma will finally result. However, since the body can metabolize this drug quickly and since alcohol itself has only the mildest of effects on the brain cells, permanent effects are rarely found in the occasional drinker.

In persons who drink heavily over long periods of time the brain cells do not have time or opportunity to recover from each alcoholic episode. After a varying time, the brain cells cannot return to their normal state; and a more chronic form of alcoholic psychosis will occur—delirium tremens. In this mental state, there are similarly the three phases described above; in addition, the toxic condition of the visual nerve results in the setting up of impulses which are interpreted and colored by the brain as visual images or hallucinations. As a result the patient "sees pink elephants," snakes, flames, etc., depending upon the emotional gestalt at the time and the toxicity of the cortex. The patient is acutely ill physically at this time, and death is not uncommon.

Where the basic personality is of the shy, suspicious type, instead of the typical delirium tremens there may develop an *alcoholic hallucinosis*. In this condition, the toxic effect on the brain does not differ essentially from that of the delirium tremens, but the personality reaction does. Hallucinations and delusions are marked. Patients appear to be almost definitely schizophrenic and are often so diagnosed when the antecedent history of alcoholism is not known or when it clears up quickly. The more

severely disturbed the personality, the less the amount of alcohol necessary to bring about this condition.

Under proper treatment with vitamins, insulin, rest, and occasional drainage of spinal fluid, most of these conditions can be cured. The brain cells for the most part have not been permanently damaged.

As the alcoholic addiction continues, however, the brain cells become less and less able to recuperate and finally a more or less permanent psychosis occurs. There are variations of this final condition variously described as *Korsakoff's syndrome* (which has marked polyneuritis associated), *alcoholic pseudo-paresis* (where the symptoms appear very much as those of the general parietic patient), *alcoholic encephalopathy* (with associated paralysis and damage to various nerves), *chronic alcoholic deterioration* (with signs of complete intellectual dementia). In all these conditions there are disturbances in the three spheres initially described: (1) physical changes, (2) intellectual deterioration, and (3) personality changes. Unfortunately, once a brain cell has died it cannot be replaced or restored; and in these latter alcoholic states, therapy is of only partial value.

There are many other toxic states which produce reactions similar to those induced by alcohol. These include delirium from such drugs as bromides, arsenic, and mescaline; delirium associated with infectious diseases in parts of the body other than the brain, such as pneumonia, typhoid fever, streptococcal throat, etc., and toxins from internal disturbances, such as hyperthyroidism and uremia.

SENILE DEMENTIA

The cells of the cerebral cortex may be damaged by the aging process. The age at which brain cells begin to die varies with each person. Heredity plays an important role; and lack of vitamins, fatigue, associated disease, and arteriosclerosis complicate the picture. Senile states most commonly begin after the age of sixty-five, though they are absent in many persons much older and appear in many persons much younger. On examination of the brain in advanced cases of senile dementia, one finds it shrunken in size and with many brain cells "missing." Physically the person has all the signs of aging. Intellectually, there is the gradual loss of memory and associated intellectual

processes. The process of deterioration is so slow, however, that many persons can readjust their habits and manner of living to an acceptable but less efficient social level. In advanced cases, the patient may forget the names of his children, may leave the house in which he has lived for many years and not be able to find his way back, etc. Finally, there are varying degrees of personality changes which range from the extremely mild and hardly noticeable to the marked and socially disturbing ones. In some persons, irritability becomes marked, paranoid tendencies develop, depressive episodes occur with suicidal drives, and even manic excitements may be present. These extreme personality disturbances require special hospitalization and care. Much can be done prophylactically for the aged by attention to diet, vitamins, type of work done, social activity, etc.

THE MANIC-DEPRESSIVE PSYCHOSES

The manic-depressive psychoses are a series of so-called mental reactions which are characterized primarily by marked acceleration or deceleration of psycho-physical activities. Because of the marked changes in mood (either exaltation or depression) this illness has often been termed a disorder of affect. Clinically, there are variations from the normal not only in (1) mood, but also in (2) psychomotor activity, and in (3) speed of thought and speech.

The symptom-complex is considerably modified by such psychologic dynamisms as are found in the neuroses, the psychopathic states, and in schizophrenia. The manic-depressive response is also frequently found as a "release mechanism" in the organic psychoses (q. v.).

ETIOLOGY

The primary cause of this psychosis is unknown. Clinical impressions lead many observers to conclude that there exists a definite constitutional predisposition.

Heredity plays an important role. However, evidence of the extent of its influence has not as yet been brought forward. The vast majority of patients who have manic-depressive reactions are not hospitalized, and, indeed, are often unrecognized as suffering from such illness. In consequence, statistical studies of the heredity factor involved do not present a complete picture. In practice, one finds in the forebears of these patients frequent histories of depressive-

like episodes, of suicides, of prolonged illnesses of unknown origin, etc.

The typical physical physique of these patients emphasizes the constitutional elements of this disorder. There are many general references to the relationship of physique and temperament, but Kretschmer formulated this status more clearly. Most of these patients (84.6 per cent according to Kretschmer; and 69, 71.4, 76.4 per cent according to three other authors) have a pyknic physique. The pyknic person tends to be of average or slightly below average height, has a round face, narrow shoulders, a broad trapezoid thorax with an obtuse costo-sternal angle, a round protuberant abdomen, fleshy limbs, small joints, little head hair after the age of thirty, and marked secondary sex distribution of hair. The cardiovascular system is on the larger side of normal.

Most of these patients have a characteristic pre-psychotic personality. They are "extrovert," being highly sociable, aggressive, dynamic, dealing with facts realistically, and are often good-humored. This "basic" personality may, however, be considerably modified by environmental pressures and psychic traumas.

The most frequent age of onset is the fourth and fifth decades of life. However, any age may be affected. In general, it can be said that the manic reactions occur later. Women suffer much more frequently than men, and "for the period from twenty to thirty-nine years the rate among males is less than half that among females" (Pollock). In general, the rate in cities is greater than that in the country. The average annual admission rate to state hospitals is about 7 per 100,000 for males, and about 11 per 100,000 for females.

Environmental stress and psychic trauma have often been mentioned as etiologic factors in individual cases. Yet in most cases there is no demonstrable stress; or the stress which is given as a cause is so mild as to be relatively non-disturbing in the average person, and has usually been non-disturbing in the patient on previous occasions, and will be equally unimportant on occasions subsequent to the illness. Moreover, some patients will develop a manic attack following a "psychic trauma"; while others, with similar disturbances of environment, will develop depressive attacks. Recovery from the illness is spontaneous and often without any change or improvement in an emotion-

ally disturbing environment. Most investigators agree that the psychologic factors do not play the primary role in causation.

Spontaneous recovery from this illness is the rule. The attacks last from a few days to several years; but the average range of illness is of a cyclic nature, so that the depressive attack is followed by a manic episode, which in turn is again followed by a depressive attack, and so on.

A further indication of the physiologic nature of this illness is the response to convulsive (shock) therapy. Depressive patients will often recover in a short period of time under such physical treatment, whereas psychoneurotic patients are rarely improved by this therapy.

Despite all these indications of the constitutional nature of the illness, modern pathologic methods have still been unable to uncover any organic disease. It is probable that the source of difficulty will be found in "functional" physiology rather than in the "structural" pathology.

NORMAL LEVELS OF PSYCHOPHYSICAL ACTIVITY

In order to follow the psychotic mood changes it is of value to review similar changes within the "normal" or average person. Each person has a level of psychophysical activity which is characteristic of him. Again, for purposes of description, this theoretic level is divided into three sublevels: mood, psychomotor activity, and speed of thought. The composite of these three levels fits within the range of a normal distribution curve for members of society, so that at one end of the scale there are persons with a high level of mood, a large amount of spontaneous psychomotor activity, and a great rapidity of thought and speech. At the opposite end of the scale are persons still "normal" but with minimal amounts of each of these characteristics. Between these extremes are many persons who have combinations of these three qualities at different levels, so that one person may be "happy" most of the time, while having lesser amounts of physical response and relatively slow thought processes; while another may be of a "melancholic" temperament and yet have high levels of energy and a rapid stream of ideas. Yet, whatever their level, these three personality functions tend to remain characteristic of the person throughout his life, although modifiable by environmental situations.

In the "norm," this psychophysical level is influenced by pleasure and pain, in that there is an elevation in mood (and the other psychophysical levels to a lesser degree) with the advent of a pleasurable stimulus and the converse with an unpleasant stimulus. Everything else being equal, the response, in either direction, will be proportionate to the strength of the stimulus. There are obviously innumerable factors which enter into the reaction of a complex personality; but in principle these positive responses to pleasure and negative responses to pain (in its broadest sense) are relatively short-lived, so that the individual person returns to his former level within hours or days after the stimulus. Where the stimulus is continuous, as in encouraging or discouraging environments, or where there are special psychologic pressures and associated neurotic responses, the psychophysical level may be somewhat elevated or depressed for longer periods of time before return to the customary level. There is a "normal" or average social range for these mood variations in the "normal" person.

In the manic-depressive psychoses, there is such marked elevation or depression of this psychophysical level as to create an *ab-normal* state. There is no definite border between the normal response and the abnormal one; and there are degrees of change in level from the feeling of cheerfulness to the acute maniacal excitement, and from the mild "blueness" to the intense suicidal depression. The manic-depressive response differs from "normal" responses to stimuli in: (1) intensity of reaction, and in (2) prolongation of reaction. The psychotic response is measured by society in terms of intensity and prolongation of response as compared with that of the average person; but medically the psychotic response must be measured in relation to the usual and characteristic psychophysical level of the person.

THE MANIC PSYCHOSES

Because of the variations in the intensity of the manic response, this reaction pattern will be discussed under three headings: (1) Hypomania, (2) the Manic Attack, and (3) the Acute Delirious Mania. The divisions among these groups is for clinical purposes; and it is impossible sharply to delineate the borderline cases from each other or from the "normal" response. These patients have various degrees

of: (1) euphoria, (2) hyperactivity, and (3) acceleration of thought and speech.

THE HYPOMANIC ATTACK

The patient who develops a hypomanic illness has a "greater-than-usual" elevation of his psychophysical level. During such a phase, he begins to "feel" more cheerful than usual. Ordinary incidents of the day, which used to depress him, now seem to be of only passing concern. He finds himself whistling, singing, or humming without any particular reason. His outlook upon life becomes optimistic and radiant. He laughs easily and often excessively. He is full of good humor and witticisms. Feelings of "inferiority" are lost and everything seems possible to him.

His psychomotor activity increases. He is constantly in motion, not in the tense, restless fashion of the anxiety patient, but with free movements. He hurries from one place to the next, jumping up from his desk, calling on the phone, talking to one person after another, all with a seemingly inexhaustible store of energy. These patients may carry on their activities till late at night, and after a few hours' sleep awake refreshed, charged with more energy. Their whole organism seems to be operating at a more efficient level. Their digestive processes are excellent, and even old persons "look young."

Speed of thought and speech increases. Solutions are arrived at rapidly and, if the hypomanic attack is not excessive, often correctly. They talk continuously, and with brilliance and wit. Most of their responses tend to be superficial because of the constant change from one topic to another. The "goal idea" changes frequently, and several ideas may be expressed in rapid succession. They are easily stimulated and distractable, noticing all things in the environment and commenting thereon. Brilliant and daring schemes are conceived and often set into motion if the person has a position of authority. His intellectual restraint is weakened, and he becomes presumptuous and overly aggressive. He may be moved easily to anger, and usually returns quickly to a state of forgiveness.

The entire clinical picture, irrespective of actual age, is that of a bubbling, overactive youth, with no restraints, who is constantly in action, constantly talking, and full of enthusiasm.

This reaction pattern may last from several weeks to several months and then be followed by a return to normal level. Often the patient, and indeed his friends, notice nothing abnormal other than that he appears to be unusually happy and active. Rarely are there psychologic or environmental stimuli of adequate intensity to give rise to such a response. The illness comes on spontaneously, and disappears in similar fashion. In many instances, such a "psychotic" personality reaction results in a "better" personality than the "normal" one. Its abnormality lies in the fact that it is an uncontrolled over-response (i.e., overly intense and excessively prolonged) of the usual psychophysical level.

In other instances, such a hypomanic attack is succeeded by a comparable decrease below the basic level—and there results a depressive state of comparable intensity. In still other cases, the hypomanic attack is of short duration and is prodromal to a typical manic attack.

THE MANIC ATTACK

The manic attack differs from the hypomanic only in intensity of symptoms. Occasionally a short-lived depressive period is present before the onset of this acute attack. The patient's mood is that of euphoria. His feeling of exaltedness is extreme, and his overestimation of his abilities leads to the diagnosis of "grandiose delusions." He sings loudly, shouting at the top of his voice. He becomes intensely active physically, running, jumping, playing with tremendous amounts of energy. He cannot be retained in his usual social position or work, because of this pressure of activity. His thought processes become so speeded up that one sentence runs into the next; his thoughts seem to have no sequence; and he comments on everything he witnesses (distractability), often without completing the intended comment. The pressure of speech may become so intense as to produce a "flight of ideas." In his calmer moments, he may be witty and sarcastic, but usually the flow of talk is rambling.

This high pitch of activity is not constant but fluctuates within the day and within the cycle of the illness. Rage and anger may be present, and even tears may occur momentarily. During these periods the patient's intellectual ability remains normal, and he is oriented, has good memory, ability to calculate, and a good

grasp of current events. Only in the intense states is there a "clouding of consciousness."

Recovery usually occurs spontaneously in from several weeks to several (three to six) months. There are many variations in the duration, from the fleeting manic attacks which last a few hours to the chronic, lifelong attacks. In many instances the recovery can be hastened by shock therapy. During the illness most patients need to be confined to institutions. After the attack has disappeared the patient may return to a normal status or may develop a depressive reaction.

THE ACUTE DELIRIOUS MANIA

As the name implies, in this phase the patient becomes so intensely active that a deliriouslike state develops. The patient may actually die of overactivity. He is so intensely disturbed as to be not only uncontrollable but confused and hallucinating. Drugs are for the most part of little value in quieting the patient. This condition is an intense manifestation of a manic attack, and the symptoms subside if death from exhaustion does not supervene.

THE DEPRESSIVE ATTACKS

The depressive phases also vary in intensity from (1) mild depressions through (2) acute depressive states and to (3) depressive stupors. The depressions are further complicated by (4) the changes occurring during menopause, resulting in involuntional melancholia; by (5) emotional tensions, leading to agitated depressions; and by (6) psychoneurotic complications, giving rise to neurotic depressions. There is also that group of depressions, (7) reactive depressions, in which the mood response seems appropriate to an extremely disturbing situation. These subdivisions differ primarily not in kind, but in intensity of depression and in the presence of complicating organic or psychological factors.

THE MILD DEPRESSION

The mild depression, like the hypomanic state, is often unrecognized either by the patient or by his friends. The onset is gradual, and the patient "feels blue." He becomes more than ordinarily inclined to worry about small incidents, and each responsibility or assignment seems like an insurmountable task. He becomes pessimistic and feels unwell physically.

The face expresses anxiety and fatigue. The patient is easily moved to tears.

An almost pathognomonic symptom complex appears. These patients find it (1) difficult to sleep, and (2) awaken tired in the morning. They (3) lose their appetites, and food seems tasteless; (4) weight loss is common; (5) constipation is frequent. There is a (6) loss of sexual libido. (7) Interest in current events and even in matters pertaining to the patient lessens and finally becomes non-existent. (8) Crowds seem to irritate the patient, and he prefers to remain by himself or with one or two close friends. It becomes (9) difficult for him to concentrate, and he gives up reading. (10) Decisions cannot be made. (11) Any innovation is dreaded and opposed.

Physically, his activity decreases to a minimum. Each movement requires great effort. Fatigue and a feeling of weakness is prevalent. The digestive process is impaired, and vague hypochondriacal pains and disturbances appear.

The speed of the thought processes is decelerated. It is an effort to think through a problem. Each problem is surrounded by marked emotion, fear of failure, and concern about dire consequences. Speech becomes slow and one central theme of concern is present.

This depressive state may not interfere with the routine life of the patient. He may continue in his business or job, being noticeably below his normal level of efficiency, but still able to perform his work. He withdraws from his friends, and frequently will visit one physician after another in an effort to find some physical basis for his difficulty. The depressive episode clears up gradually, and the patient recovers, returning to his "usual" level of psychophysical activity. The duration of such an episode varies from a few months to a few years.

THE ACUTE DEPRESSION

The acute depressive episode varies from the mild attack only in intensity. The patient feels intensely melancholic and hopeless. There seems no value left to anything in life. Efforts to convince him to the contrary will fail, even though the patient may actually have achieved much. He tends to depreciate all his own assets, and to overevaluate those of others. His mood becomes so depressed that suicidal thoughts will occupy his mind, and often there are actual suicidal attempts.

Physical activity is greatly depressed. The patient may sit about for hours doing nothing, staring into space, and crying. In the *agitated depressions* there may be restlessness, wringing of the hands, constant picking at the face or rubbing of the scalp. The patient looks prematurely old, and constipation often becomes extreme. The loss of weight is rapid, patients not infrequently losing thirty to forty pounds in a few months. Sleep seems lost altogether, despite the use of powerful sedatives.

The stream of thought is similarly retarded. The patient finds it difficult to make the simplest decision, and in extreme cases cannot decide what dress to wear, what shoe to put on first, etc. At the same time there is considerable worry over nonessential incidents, worry which never leads to a solution. The speech becomes slow and soft-toned. In the *depressive stupors*, speech may cease altogether, and the patient appears to be in a coma except for his open, unblinking eyes. In the agitated depressions there may be constant talking, of the whining, complaining variety.

In some of the agitated depressions there are feelings of guilt. The patient is sure that he has been the cause of the death of his father, or of illness in his family. He may feel that he has "committed the unpardonable sin." He develops delusions of poverty, of malignant illness, of impending disaster. Intense suicidal drives are found in these patients.

The *involutional melancholias* appear to be similar to the usual depressive attack. Although many medical authorities believe that the deficiency in ovarian hormone is the primary etiologic factor, this point is in dispute. In any event, most of these cases follow the same pattern as other depressions.

In the *neurotic depression* the patient's main complaints dwell upon physical ailments. Often these patients are diagnosed as being psychoneurotic, but further investigation will usually unearth an underlying manic-depressive depression.

The duration of the depressive episodes varies widely. The average case lasts from one to two years; but some cases have fleeting attacks once a month, and others have attacks which continue throughout the life of the patient. Each depressive attack has a spontaneous remission. Many of these episodes are followed by a manic attack, while in other instances there is a

period of normalcy after the attack, only to be succeeded by another depressive episode.

The treatment of the mild attacks is primarily through constant reassurance, work guidance, and socialization. The severer attacks usually need to be dealt with in a hospital because of the danger of suicide. Convulsive (electric) shock therapy is of great value in clearing up this type of illness. Psychotherapy, directed toward any associated psychoneurotic tendencies, is important.

SCHIZOPHRENIA

The schizophrenias are a group of personality disorders, rooted in a constitutional predisposition, occurring most commonly after adolescence, mediated by a disturbance in affect and conation, and manifested by symptoms of withdrawal into fantasy, disturbed emotional control, altered function of association processes, and intensive use of projection mechanisms.

The present concept of schizophrenia has emerged by stages during the last century. In 1850, Morel used the term "démence précoce," although the condition he thus described was far more inclusive than the present equivalent. Kahlbaum (1863) used the term "vesania," which, though more definitive, was nevertheless vague in its outlines. Hecker (1871) described a condition of hebephrenia, and Kahlbaum (1874) culled out a mental state which he called catatonia. Kraepelin (1887) defined the symptom complex of dementia praecox which is in use today. Bleuler (1911), while concurring in this syndrome, objected to the term "dementia praecox" since many cases do not develop dementia, and many cases are not "precociter." He advocated the use of the term schizophrenia (Fr. *schiz*, split; and *phrenia*, mind).

ETIOLOGY

The etiology is unknown. Heredity appears to play some role. Koller and Diem advanced statistics indicating that a large percentage of schizophrenic patients have significant family histories; but they included as evidence of hereditary tainting such conditions as "psychoses," "nervous diseases," alcoholism, apoplexy, senile dementia, and "abnormal character." A large, though somewhat smaller, percentage of normal persons have similar factors in their background. Such statistics leave much to be

desired. Humm finds that 3 to 5 per cent of the siblings and of the parents have schizophrenia; but these figures must, in themselves, be regarded as an estimate, inasmuch as there are many minor schizophrenic reactions which never come to the attention of institutions or investigators. From rural districts, for example, there are about half as many patients admitted to hospitals for mental disease, in proportion to the population, as there are from urban centers. Adjustments to city life are more difficult, hence the greater number and intensity of precipitating factors; moreover, many personality disturbances which cause little conflict on a farm create marked disturbance in a city. Rosanoff, et al., in a study of identical twins, finds that 68 per cent have the schizophrenic illness in both siblings, whereas only 5 per cent of non-identical twins have the illness in both siblings. Rosanoff's studies would indicate that the inherited constitution is an extremely important though not the only factor. Ruxlin, on the basis of similar studies, states that schizophrenia is transmitted as a recessive character of the Mendelian type.

The physical constitution of these patients, according to Kretschmer and subsequent authors, is of an asthenic-athletic type. Dysplastic types also occur frequently. From an anatomico-physiological point of view, these patients tend to have a long, narrow heart which weighs less than that of the average patient of the same age, low blood pressure, low basal metabolic rates, and other evidences of physiologic sluggishness. These differences, however, are relatively within the normal range rather than abnormal. Pathologic studies do not reveal any characteristic organic defect.

Statistics show that this disease has the highest hospital admission rate of any single mental disease. In this connection it is interesting to note that whereas 19.6 per cent (1941) of all first admissions to the state hospitals are schizophrenics, 50 per cent of all patients who remain in state hospitals are schizophrenic. This discrepancy results from the fact that patients of other groups either recover or die, whereas the schizophrenic patient tends to live for many years in an institution. The peak age of admission of these patients to state institutions is in the middle twenties, but this fact again needs clarification. Many patients have symptoms for a long period of time before they are admitted

to an institution, and many other patients do not develop the illness in chronic form until the middle thirties. Marital status also seems to play a role; the incidence of this illness in the single, widowed, and divorced is much higher than in married persons.

The prepsychotic personality, in a large proportion of cases, presents, as Hoch pointed out, a characteristic pattern. From earliest childhood, these patients, while still not abnormal, are much more shy, much more sensitive than other children. Their feelings are easily wounded and they tend to brood. They are likely to daydream and read while other children are out playing. They are more asocial, desiring the company of others and yet feeling ill at ease and at a loss for words in the presence of others. Usually they are quiet, obedient, and "cause less trouble" than the average child. They seem lacking in energy, though they may excel scholastically. Many schizophrenic patients have been among the best of students; yet, when they enter competitive life after leaving school, they seem not to do so well as their less scholastically able companions. To the observer, these persons seem normal; within the patient there are marked feelings of inferiority, moralism, and excessive inhibitions.

Many normal persons who never develop any psychotic responses have similar backgrounds, so that such "introvert" personality traits are not pathognomonic of schizophrenia. Conversely, however, schizophrenic patients are rarely "extrovert."

The constitution of the patient, despite its significant characteristics of physique and temperament, is, in itself, usually insufficient to bring about a schizophrenic reaction. Rosanoff's studies of one hundred identical twins, in which 68 per cent of both identical twins suffered from schizophrenia, indicates that in the remaining 32 per cent there must have been a precipitating factor.

Various precipitating factors may occur, and the illness results from the interaction between these factors and the constitution. Where the constitution is extremely susceptible, ordinary events of life will often bring about an abnormal personality reaction; where there is relatively less predisposition, greater stress is necessary. The precipitating factors may be: (a) physiologic, (b) organogenic, or (c) psychologic.

The physiologic precipitators may occur with the physiologic changes that develop at puberty, at pregnancy, and with menopause. Only rarely do schizophrenic psychoses begin before adolescence, a fact indicating the presence of some powerful relationship to the psychobiologic changes during this period. Similarly, psychotic responses may occur after pregnancy and during the menopause.

The organogenetic precipitating factors include all toxic, infectious, degenerative, traumatic, and neoplastic states. With any one of these illnesses, a susceptible constitution may react with schizophrenic symptoms.

The psychologic stresses are multitudinous, the more disturbing ones being those of pride and ego wounding aspect rather than those involving material deprivation. A patient's feeling of being unwanted, of conflict over competition with a sibling for a parent's affection, of inferiority and inadequacy as compared with some ideal standard, of resentments over minor or imagined slights, and many other similar psychic "traumas" act as potent forces in accentuating the sociability and the withdrawal from reality already present in the susceptible person.

In substance, therefore, the etiology of schizophrenia may be said to be the result of (a) susceptible, inherited constitution as modified by (b) physiologic changes (such as puberty) and as precipitated by (c) organogenic or psychogenic forces.

SYMPTOMS

The symptoms vary widely from that of the patient who deteriorates quickly and must be hospitalized early in the disease to that of the patient who has a slowly developing paranoid state but has enough balancing features to live for many years in society without requiring hospitalization. Most cases, however, follow a rather typical pattern.

The usual onset occurs after adolescence in a shy, sensitive, quiet person. The earliest signs are usually those of withdrawal. The patient, already aloof, mingles less and less with his friends, and spends more and more time alone, reading or daydreaming. Daily events no longer seem to interest him; and situations in the business, scholastic, social, or political worlds, which ordinarily arouse comment and reaction, are ignored or given only the slightest of

response. During all this time he appears normal—"but quiet." He becomes preoccupied, sitting for hours without moving. Often he does not read or understand the book which he holds before him. He seems deep in thought, yet, when questioned as to what he was thinking of, replies, "Nothing." His thoughts are vague, unspecific, wandering. He seems unhappy, dissatisfied, depressed and does not relish any of the entertainment in which he formerly indulged. He may develop an abnormal interest in philosophy or psychology, feeling that he is "going crazy" and seeking some means of help. He may have waking dreams about sex, yet avoid the company of women and indulge in excessive masturbation. Occasionally he develops a religious fanaticism, often even despite a background of indifference to religion. He becomes sensitive to an extreme, and his pride is wounded by imagined slights or the unthinking actions of his friends. His conversation becomes erratic, and often he is evasive, circumlocutious, insinuating that something is wrong without committing himself. Ideas of reference develop; and the smile of the passerby, the conversation of two strangers, the joking story of a friend, all have special and usually sinister meaning and significance to the patient.

Gradually his work habits deteriorate. He becomes less efficient and makes thoughtless mistakes. Eventually he leaves his job or is discharged because of his preoccupation and queerness. His habits deteriorate so that he no longer presents a neat appearance, his clothes becoming unkempt, the underclothes often being unchanged and odorous, the face unshaven, the hair uncombed. Such deterioration is especially noticeable in women patients. The patient becomes suspicious of his acquaintances, and imagines that they dislike him. A misplaced tool at his workbench, a missing eraser from the typing desk, a smudge of ink on the study book, all indicate that someone deliberately was irritating him. Gradually the feeling of being irritated develops into a "persecution complex," and his acquaintances seem to be organized into a "gang" whose sole function is "to get him." At first the patient has no clear idea of why he should be so persecuted, but after a period of time his rationalization processes develop a reason and a plot.

The patient begins to laugh and talk to himself, smiling, grimacing, or making gestures to

himself. His former affection for his parents or family suddenly turns to rage and intense dislike—alternating at times with overwhelming demonstration of love. He has difficulty in sleeping, staying awake far into the night and lying in bed till late in the morning. His appetite is altered, and he may not eat for days at a time, or, suddenly, wolf down several meals in one. His words and actions no longer seem appropriate to the situation.

The whole process may take years to develop, or may be precipitated by a pregnancy, a surgical operation, an acute illness, etc. The patient will appear to be acutely fearful, rambling incoherently about plots and dangers. He may see figures peering at him through the windows, men following him on the street, and hear noises which are sounds of danger. His excitement may become extreme. He may begin to run about the house shouting, talking rapidly and senselessly, destroying furniture, dishes, and all objects which come to his attention. The food may seem poisoned to him, and his family may appear to be in a plot to kill him. Delusions and hallucinations of all sorts develop. He may become exhibitionistic, or may masturbate in public. He may make crude sex proposals to strangers, or insist that "voices" accuse him of "awful" sexual thoughts. His reaction usually becomes so intense that he needs to be sent to a hospital.

In the hospital the acute symptoms usually subside after a period of time, lasting from several hours to several months. There are many variations in the clinical picture. One patient may become mute, refusing to speak, lying unmoving for hours, staring into space, and not attending to the eliminatory functions. Others will elaborate on their delusional story, weaving complex plots and suffering from vivid hallucinations. The appetite becomes capricious and the patient may need to be tube fed to prevent starvation. Sleep is poor, and sedatives may be necessary. Restraints may be required should the patient attack other patients in the ward. In the later stages there may develop peculiar repetitive mannerisms (stereotypes), all statements heard may be repeated (echolalia), or all actions mimicked (echopraxia). Negativism may be extreme, the patient not only not cooperating but doing the opposite of what is asked. There may be alternating periods of stupor and excitement.

In institutions most patients reach a level at which the disease is arrested. These patients retain their delusions and mental aberrations but can be utilized in farm work, laundry work, and in all the household duties of an institution. In schizophrenic patients the major cause of death is tuberculosis, and almost half of these patients live in the state hospitals for more than twenty years before death. Many patients can be paroled from the institution to return to their homes; and, even though they are not cured, they may be able to adapt themselves on a lower social level. However, large numbers of them need to be readmitted to the institution as a result of recurrence of symptoms.

SUBDIVISIONS OF SCHIZOPHRENIA

According to the standard classification, there are four subdivisions of schizophrenia. These subgroups are, however, extremely vague in their outlines, and are difficult to distinguish except for the relatively "pure" case.

The *Simple Schizophrenic* person is often unrecognized as suffering from a mental illness. He is usually withdrawn to an extreme but still capable of social existence on an inferior level. There is practically no interest in the outside world either in terms of the social situation or even of the opposite sex. Many of these patients, despite extremely high intellectual abilities, wander about the country working as laborers, dishwashers in restaurants, waiters, etc.; and their period of employment at any one time is short-lived. Much of their time is spent in daydreaming, and mild delusions are present. They are usually considered as "queer" but rarely come into conflict with society except when arrested as "vagrants."

Hebephrenic Schizophrenia (*hebe*, puberty) occurs most frequently after puberty and adolescence. This form is the most acute and the most rapidly deteriorating one of the schizophrenic reactions, and presumably has the greatest amount of constitutional predisposition. The symptoms are silly, childish behavior, extreme impulsiveness, violent unexplained laughter, intense but rapidly changing and unsystematized delusions, vivid hallucinations, fragmentary utterances, and early loss of control over bowel and bladder. Complete dilapidation and early death is common.

Catatonic Schizophrenia (*cata*, decreased;

tonus, tone) is characterized by disturbances in motor control, in variation from depressed to excited states, and in stupor. During their illness, these patients are extremely quiet, often completely mute, and refuse to eat. They also exhibit marked negativism, and are indifferent to painful stimuli. A motility disorder called *cerea flexibilitas* (waxy flexibility) occurs, so that their arms or other muscles can be placed in the most distorted of positions (as one could in a stiff-jointed manikin) and will be maintained in those abnormal positions for hours at a time. These patients may have temporary periods of frenzy and rage, which usually subside quickly, to be followed by extremely long periods of immobility.

Paranoid Schizophrenia (*para*, twisted; *noia*, thinking) is characterized primarily by "ideas of persecution." Most paranoid reactions occur later in life, indicating less of a constitutional predisposition than in the hebephrenias, and usually with greater disturbance resulting from psychogenic factors. Many paranoid schizophrenic patients live for years in a community, keeping their delusions to themselves and having sufficient balancing personality factors to earn a livelihood or to adjust on an inferior social level. Initially there is marked vagueness in thought and action, followed by vague feelings of persecution. These patients often have more energy than other types of schizophrenic patients and may maintain a fairly high work output while their delusions are developing. The delusions are at first fragmentary; but, as the patient begins to rationalize and justify them, they become woven into a complete pattern—into systematized delusions. Eventually these patients either express their delusions and hallucinations or commit some violent act as dictated by these ideational or sense falsifications, and are committed to an institution. Paranoid patients usually live to an older age in mental hospitals than do other schizophrenic patients.

A condition of true paranoia has been described. This condition presumably differs from schizophrenia because of the absence of hallucinations or incoherence of thought, and the retention of interest and efficiency in social situations. It is more likely, however, that these states represent one of the forms of paranoid schizophrenia, in which deteriorating symptoms appear late in the illness because the con-

stitution is least involved and psychogenic factors most potent.

SCHIZOPHRENIC PSYCHOLOGY

Within the framework of the constitutional predisposition can be seen a definite pattern of psychologic mechanisms.

In the prepsychotic state, as has already been mentioned, most patients show a disturbance in affect. For the most part, this affect is seen in "sensitivity" and in "easily hurt feelings." These patients, in childhood, experience emotional disturbances even more keenly than the ordinary child, though their reactions to such emotion is one of inhibition rather than of expression. They are more than usually fearful of meeting strangers, of new situations, and of criticism. They feel insecure and in need of constant reassurance and moral support. They tend to over-react to irritations and slights; and, instead of forgetting shortly, as is the tendency of their more extrovert companions, they brood and elaborate upon their hurts. Their emotional responses are either inhibited, resulting in brooding quietness and "imaginativeness," or, if expressed, are excessive, violent, out of proportion to the stimulus, and highly symbolic.

This emotional sensitivity leads in the prepsychotic state to withdrawal from possible hurts and to shyness. Actions which may give rise to criticism are avoided, so that the patient is a "good" child and obedient. For the same reason, later in life there is an excessive moralism extending to any desire which is socially taboo. Since desires are ever-present, there arise conflicts and feelings of guilt, even in children—guilt at the thought of having a socially taboo desire. Most of the thinking becomes subjective, related entirely to their own feelings; and there is relative disinterest in the world about them, in other playmates, in games. These reactions involve "affect," differing from the usual emotional reaction in their method of expression, and are present in the pre-psychotic state.

When the schizophrenic psychosis occurs, precipitated by some physiological, organic, or psychologic stress, the psychology of the patient is manifested by: (1) withdrawal into fantasy, (2) marked disturbance in emotional control, (3) altered function of the associative processes, and (4) intensive use of psychologic mechanisms.

WITHDRAWAL INTO FANTASY

In the illness the shyness of the prepsychotic state becomes extreme. Reality is more than ever too painful to face directly, and daily events too irritating. The patient withdraws from his contacts and from reality and spends more of his time in reverie or fantasy. External events penetrate less and less into consciousness. The thoughts, unchecked by reality, deal with vague wishes, fears, repressions, and emotional experiences; the resultant verbal and motor responses of the patient are disconnected, vague, and bizarre.

In fantasy the association processes have "free flow," unchecked by objective comparison or even by conscious control; and the associations become guided purely by emotional relationships. When there is primary emotional concern, the fantasies (associations) will revolve about this central theme, but the thoughts about such a central idea will still be amorphous and dreamlike. At first the fantasies are pleasant and "wish fulfilling"; but the inhibitions and repressions, operating even within daydreams, soon give rise to frightening and emotionally painful fantasies. The guilt feelings which arise, and the resultant wishes and fears, desires and repressions are then expressed in symbolic fashion.

The patient is completely concerned with himself—subjectivity is all-inclusive. Egocentricity is the basis of his thought. Even the external events which do penetrate to his consciousness have a special meaning for him (ideas of reference). The greater the withdrawal into fantasy, the less the corrective effects of reality. A vicious cycle is thus created, and the habit of living in fantasy becomes more and more fixed.

Despite all this withdrawal and lack of contact with reality, the patient's sensorium remains clear. When the patient can be stimulated to pay attention and respond, his orientation, memory, ability to calculate, etc., will be shown to be normal, even though he is otherwise deteriorated. This condition is in sharp contrast to the thinking changes of the organic psychoses wherein the sensorium is disturbed but contact with reality is maintained.

DISTURBED EMOTIONAL CONTROL

Conscious control over the emotions is minimized or lost. The patient feels keenly dis-

turbed, yet "automatically" inhibits the expression of his feelings. He becomes apathetic and unresponsive to situations which are emotion-producing in the "normal" person. This lack of emotional response is the result not only of inhibition, but also of the intense subjectivity of his disinterest in the difficulties which affect others. Little, if any, attention is paid to these external affective conditions unless in some way they strike a receptive chord in the patient's subjective evaluation. Moreover, by means of this emotional withdrawal, the patient builds a protective wall about his sensitized ego.

Despite such attempts at protection of the self against painful emotions, disturbances continue to occur within the patient's stream of mental activity. The free flow of associations, unchecked by reality, guided solely by emotional associations and pain-pleasure conflicts, results in an elaboration of the emotional tones. Minor irritations, long dwelt upon, become intense hates; mild feelings of inferiority become intense guilt reactions. The emotional tension within the patient mounts; it may be completely inhibited by withdrawal into a state of stupor, or it may be expressed symbolically or in a violent outburst of emotion. The associative processes become so overcharged with affect as often to result in immediate expression—as impulsive acts. Minor irritations, unchecked by normal control, produce violent attacks upon the offending person. Lifelong normal affections may thus be overruled in a moment's disaffection.

The emotions thus developed may be displaced and discharged upon some incidental irritation. A trivial act, of no apparent relation to the patient, may serve as a focus upon which to vent the stored-up tensions. The guilt feelings become intense; the patient attempts to relieve his ego of the emotional pain by projecting the cause of the guilt, blaming others (delusions) for the series of events which resulted in his state. He projects the guilt feelings into the sensory field (hallucinations), audibly hearing the accusations made by "someone else."

The catatonic patient, for the most part, inhibits his emotional tensions, and is thus frequently found in the state of mutism, negativism and stupor. The paranoid patient for the most part, attempts to deny his responsibility for the intensified guilt conflicts, and, projecting

them, develops systematized delusions. However, no sharp line of distinction can be drawn between these two groups, for all these processes occur in all the forms of schizophrenia.

ALTERATION IN THE ASSOCIATIVE PROCESSES OF THOUGHT

It is the disturbance in associations which render the verbal and physical responses of the schizophrenic patient "queer." On the basis of the constitutional predisposition, the disturbance in affect (i.e., the hyper-sensitivity) results in marked subjectivity (egocentricity) and marked inhibition. The association processes, over-concerned with the self and losing contact with reality by withdrawal into fantasy, become dominated by feeling tones rather than by "logical" or experimental facts.

There results: (1) A dissolution of many acquired patterns of association, so that the patient not only does not carry out his usual social responses, but changes his accustomed manner of dressing, become sloppy in his appearance, "forgets" his ordinary table manners, and his methods of eating. His associative processes no longer follow the direction of previous training.

(2) The associative processes become fluid and do not adhere to the more rigid regulations of experience and of reality. The emotional tones of each association bring about other associations with similar emotional tones, and the associations flow in many directions without "reason" or common "understandability." This fluid, "unrational" flow of associations is seen in the following verbatim statement. The patient¹ who was admitted to the hospital in a state of acute excitement, improved somewhat under shock therapy, and, on request, gave the following explanation of her previous actions: "A gray-haired woman taunts me about my glasses." (Actually, this woman had just walked into her room and had said nothing.) "They've taken mine away. So I snatch hers. They're rimless. I twist the nose-piece till it breaks, hurl the now-separate lenses to the floor. I think about having to wear those glasses. I despise them so. Then the idea flashes. It's my right eye that is more nearsighted. It offends me. The Bible says to pluck it out. I try, but the muscles are stubborn. I whimper at this frustration. The

nurse hears me. My finger nails are cut short while I kick and spit at them. How dare they? She tells me to behave myself, to act like a lady. I relax, but gaze up piteously while the inexorable snip-snipping goes on. How tender my finger tips are. I stare at my nails. The deep color of the polish disgusts me." (The patient had to be restrained because of the attempt at self-enucleation of the eye.) This flow of associations indicates how changeable is the direction of the flow and how impulsive action follows incidental associations.

(3) There is an intensification of the emotional tone of the associations so that minor incidents assume intense affect. The "thought" of the above patient that the eye "offends me" is sufficiently disturbing to result in an abnormal response. Stimuli which "penetrate" through to the patient result in overwhelming and out-of-proportion reactions. Violence may occur apparently without cause, but on further examination one finds that the stimulus for the action had long existed. Thus, one patient "had a pet cat for five years. It was cute, and I played with it a lot. It scratched me. I didn't do anything right then, but I thought about it, and then took it out and killed it." The expression of such emotional intensifications is, however, inhibited in most patients, and comes to the surface at infrequent intervals.

(4) There is a loss of ability to direct the flow of associations. These patients are unable to "think through" to a conclusion because of the fluidity of their associations. Subjectively, they complain of an inability to concentrate and of their "thoughts wandering." Objectively, they seem preoccupied with a problem, but in the advanced stages there is no ability to "reason out" the problem. In the early stages of the illness, the patients are often able to give correct solutions to a question, provided the span of attention required is not too long; but the flow of associations is so controlled by the emotional patterns, that "logical thought," with consideration of experiential factors, is difficult, if not impossible.

(5) There is, however, a grouping of associations around emotionally intense concerns. Desires, fears, conflicts, all serve as centers towards which, and from which, the emotionally toned associations flow. When subjected to psychologic mechanisms, these "emotional centers" form the basis of delusions and hallucinations.

¹ Case history through the courtesy of Dr. J. O. Freund.

In the deteriorated schizophrenic patient, who has lost all contact with reality, these delusions are fragmentary and unrelated; in the slower developing illnesses, wherein more contact with reality is maintained, as in the paranoid patient, the delusions are woven into a unified pattern.

INTENSIVE USE OF PSYCHOLOGIC DYNAMISMS

The various "unconscious" mechanisms utilized by the personality in the normal or in the prepsychotic state to protect itself against the wounding of the ego are even more intensively practiced in the schizophrenic state. Particular use is made of the mechanisms of repression, rationalization, symbolization, projection, and systematization. Such psychologic measures are utilized by neurotic persons and by "normals," the difference from the schizophrenic patient lying in the "reality testing." The normal or neurotic person modifies the use of these mechanisms in varying degrees, in conformity with the total gestalt of the personality, the problem, and the prevailing environment. The schizophrenic patient, being withdrawn, does not have the modifying influence of reality on the already unhealthy psychologic mechanisms; and the resultant psychologic responses are "queer," bizarre, and un-real. The patient represses and inhibits his emotions more intensely than the neurotic patient, and expresses his conflicts in the exaggerated symbolism of delusions, mannerisms, stereotypes. His ego, extremely sensitive in the prepsychotic personality, is even more sensitive in the illness, and the guilt feelings are rationalized into acceptable "others-being-responsible" causes (delusions). The projection mechanism is strongly operative in the delusions and hallucinations.

The use of these various mechanisms is further complicated by the distortion of the associative process; and the greater the fluidity and lack of goal direction of the associations, the more bizarre and incomprehensible the results of the symbolization, projection, etc. The deteriorated patient instead of expressing clearly defined delusions, definite mannerisms, etc., speaks only a "gibberish" or "word salad" and moves in aimless, incoherent fashion.

The content of the delusions utilizes the knowledge of the patient and the general concepts of the day. Thus, in the Middle Ages, the

delusions of the schizophrenic patient were centered about witches and devils who tempted and taunted the patient. Werewolves and mystic incantations played an important role in the patient's explanations (rationalizations and symbols) of his emotional unrest. In this century, the patient's delusions center about radio waves, on electricity influencing the mind, on dictaphones recording one's thoughts, and with television spying upon him. The form of the delusions is thus of little diagnostic value.

PROGNOSIS

Once the illness has developed, the prognosis in schizophrenia is relatively poor. The rate per thousand schizophrenic patients discharged as recovered is 7.3, in contrast to the rate of 142.8 for manic-depressive psychoses (*Annual Statistical Review, 1940, State of Illinois, p. 58*). The number of schizophrenic patients remaining in mental institutions is almost half the total population of the institution. Frequently, the patients improve sufficiently to be returned home, on parole, and many are able to live on an inferior social level particularly on a farm or in a rural district. However, many patients break down and need readmission to the hospital. In the hospital, many patients are able to assist in the "household duties" and perform fairly well although their work is often interrupted by acute psychotic episodes. A common cause of death for these patients is tuberculosis, and the median age of death is 56.2 years (median age at admission being 30.2) (1940, Illinois, *ibid*).

Since the advent of the shock therapies, the prognosis for early cases has greatly improved. If the patients are treated early in the disease; i.e., within six months of the onset of the acute symptoms, the percentage of recoveries is high. The statistics for such recoveries are still unreliable, the originators of the shock therapy claiming that more than 75 per cent of the cases recover under their therapies, but further experience indicating that the rates are much less. Treatments given after the patient has been ill for several years seem to have little curative effect. However, even markedly deteriorated patients apparently benefit from such therapy in that they are better able to take care of themselves, and are able to cooperate more effectively in minor routine duties.

TREATMENT

Until 1935 the treatment of schizophrenia varied with each physician. Almost every conceivable method of therapy was used. Psychologic therapy, removal of possible sources of infection, colonic irrigations, fever treatments, prolonged sleep treatments, etc., were all tried; and though each seemed to have some measure of success, they failed in the hands of most investigators. In the 1930's, Sakel of Vienna suggested the use of prolonged insulin comas in the treatment of the schizophrenic patient. About the same time, Meduna of Budapest suggested the use of convulsive shock therapy. Both of these therapies have come into wide use, despite much initial opposition.

The present consensus is that these physical treatments are of the greatest value in schizophrenia. The convulsive shock therapy is relatively less effective in schizophrenia than are the insulin comas. Initially, Meduna used metrazol as the convulsive agent. A host of these agents have been tried; and at the current writing, the induction of convulsions by electric shock is the method of choice. It seems to matter little in terms of results how the convulsion is produced. The number of convulsions given varies from ten to forty and as a rule are given every other day. There are, however, many individual variations in this treatment.

The insulin coma treatment consists, in essence, of giving the patient large doses of insulin early in the morning and withholding food for four hours. The dosage of insulin is increased daily until coma results. Comas are usually permitted to last one to two hours, after which the patient is revived by food given via stomach tube or by glucose intravenously. Usually, the average patient is given from fifteen to fifty insulin comas as a course of treatment.

An essential element in treatment in addition to these shock methods is psychotherapy. There are at least six principles in this psychotherapy.

- (1) Constant encouragement and reassurance,
- (2) extremely gradual effort in persuading the patient to face reality,
- (3) avoidance of trying to convince the patient that his delusions are fallacious,
- (4) explanation of symptoms on a physiologic or psychologic basis,
- (5) therapeutic discussions about emotional conflicts, avoiding

initially too specific an approach to the patient's problem, and (6) socialization and work therapy. Under the combination of shock treatments and psychotherapy of this sort many patients in the early stages of the illness seem to recover completely and remain well.

Later, a surgical technique has been developed in the treatment of psychotic patients. Certain areas of the frontal lobe of the brain are separated surgically (prefrontal lobotomy) from the rest of the brain. Some of the cases so operated on seem to have had excellent results, but final conclusions cannot yet be drawn.

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PSYCHOSEXUAL FUNCTION IN WOMEN.—Introduction:

The psychosexual development of each individual—men and women alike—is a complex process: it is the evolution of an innate anlage (constitution) under the influence of the environment. Environment in itself is an intricate interplay of culture and its effects on the individuals who represent the immediate environment of the child. Since the immediate environment usually is created by the parents, the genetic and the environmental factors become so closely interwoven that only a detailed analysis of all factors will reveal which elements of the emotional development of an individual are determined by genetic factors and which are the results of environmental influences. The interplay between biological and environmental factors represents the field of investigation of the dynamic psychology, which offers the concepts upon which we will elaborate in our discussion of the developmental process of the women as it unfolds in our culture within the family.

PSYCHOSEXUAL DEVELOPMENT

According to the concepts of psychoanalysis, the sexual drive is a manifestation of energy originating in the process of growth and it results from integration of various tendencies which spring from the needs of the growing individual. The earliest phase of this development is determined by the relationship between mother and infant. The woman's emotional satisfaction in being a mother, her instinctive readiness to nurse, to feed, to take care of the baby, not only satisfies the infant's physiological needs but also provides it with pleasurable sensations. Out of the gratification of the receptive needs develops the infant's first emotional attitude* the confident expectation that the mother will satisfy all needs. This has the same importance in the psychosexual development of the infants of both sexes; boys and girls alike become deeply disturbed in their emotional life if such confidence cannot develop. If, as it normally occurs, the early relationship to the mother is undisturbed, the mother becomes the first teacher of the infants of both sexes. Under the sheltering security of routinely returning gratification the infant is led by the mother gradually to new activities. Through her the infant discovers the first objects of its surroundings and learns to walk, to talk, and to control its sphincters. Together with this self-assertion begins to play a role in the emotional manifestations of the infant. In this phase of development, which occurs in the last quarter of the first year and/or in the beginning of the second year, one may already observe definite differences in the behavior of the sexes which are motivated by specific emotional needs. These, in turn, are caused by the difference in the anlage. Although similarly important for the normal development of both sexes, the emotional security which results from the undisturbed confidence in the mother affects the infants of both sexes differently. It gives the boy permission for self-assertion and a sense of courage in using his growing muscular power; thus he may free himself from his dependence on the mother in order to start a development in which identification with the father becomes the leading motive. The girl's development

takes a different course: the sense of security with the mother gives her the first and most effective impulse for identification with her. As long as the girl's relationship with the mother remains undisturbed, i.e., unambivalent, she will easily imitate the mother, follow her advice and learn from her without conflict. As an example of the behavior manifestation of differences in developmental tendencies we may cite the fact, quite well known to mothers, that the toilet-training of boys is usually a much harder job than the training for habit-formation of girls. This seems to indicate that girls learn from the mother by identification willingly while boys learn if and after their need for self-assertion was satisfied too. Several behavior manifestations, which are decidedly feminine, may be noted already in the two year old or even younger girl: her walk, her talk, her interests, her activities are different from those of the boys. The little woman can be recognized in the infant especially by the gestures with which she approaches persons of her environment or responds to them. For example, the girl overcomes her shyness usually with some touch of flirtation, the boy with some self-assertion.

Even more significant for the development of the psychosexual function are those manifestations which show the child's libidinal interests in its own body. In this respect the dissimilarity in behavior is easily recognizable and, according to psychoanalytic concept, is directly related to anatomical sex differences. The little boy, aware of the organ which produces pleasure, concentrates upon his genitals for gratification;¹ the little girl's interest in her body remains diffuse and is mostly expressed as generalized pleasurable sensations and curiosity in herself. The little girl's great pleasure in looking in the mirror, for example, is not only imitative. There was, and still is, much discussion in the psychoanalytic literature about the primary sexual development of the woman. Freud's thesis is² that the girl's genitals, except for the clitoris, remain completely undiscovered and without

¹ Freud, S., "Some Psychological Consequences of the Anatomical Distinction Between the Sexes," *Int. J. Psycho-Anal.*, 8, 133, 1927.

² Freud, S., "Three Contributions to the Theory of Sex," *Nervous and Mental Disease*, Pub. Co. New York, 1930. Freud, S., "Concerning the Sexuality in Women," *Psychoanalytic Quarterly*, 1, 141, 1932.

*Therese Benedek, "Adaptation to Reality in Early Infancy," *Psychoanalytic Quarterly*, Volume VII, No. 2, 1938.

sensations until puberty, and that, therefore, her first sexual response is that of curiosity regarding the genitals of the other sex and of making comparisons with her own; the resulting feeling of inferiority nourishes in her a steady envy of the penis. Other investigators assume that the evolution of the feminine sexual anlage arouses the girl's interest and curiosity in the other sex. There are many observations recorded showing that little girls of well adjusted parents do not seem to show sexual curiosity regarding their brothers or playmates nor regarding their fathers until after they have achieved a special developmental age, usually that of three to four years. Experiences may determine the developmental course in this respect; observations of others or sensations in her own body may steer the attention of the little girl in one or the other direction. Any conflict which may arise between mother and daughter at this early age threatens the girl with the loss of her mother's love. Thus the girl gives up many of her primary desires to save herself the security of the dependence on the mother.³ Although this may delay her development, at the same time it gives her opportunity for the process of identification with the mother which finally leads to the next developmental phase, in which the girl becomes able to give up the mother as the exclusive object of gratification and turns to the father for gratification of her libidinous desires.

One of the earliest observations of psychoanalysis is that the psychosexual development of every individual reaches its most important juncture at this intensification of the emotional attitude toward the parent of the opposite sex—this is referred to as the Oedipus complex. When the girl turns to her father for gratification, she comes into conflict with her mother, the source of gratification of her dependent needs. Thus, at the oedipal phase of the development we meet for the first time the conflicting tendencies of wanting to be the child—to be loved by the mother—and the desire to be in her place and to be loved by the father. The competition with a not well adjusted mother may carry with it guilt and the fear of punishment; this may be accepted by the girl as a stop-signal; she turns back in her development

to remain the infantile person safe in her dependence. The normal evolution of the oedipal phase causes few disturbing manifestations. The children appear free in expressing their curiosity, their demands; the almost insatiable pleasure in quizzing the parent is a manifestation of the tendency to master these emotional needs. Children whose confidence in their parents has been shattered behave differently; they may become shy and ashamed of their body; they may masturbate compulsively without relief; anxiety attacks, nightmares, and other symptoms may disturb the child until she is able to conquer the onrushing and conflicting emotions.

This is the time when the girl's awakened curiosity leads her to the discovery that her body is different from that of the boys; she detects the penis. This discovery, as well as the more or less obviously preoccupation with it, is the expression of her own heterosexual tendency. The manifestations of the heterosexual tendency in a child are quite different from the mature adult expression of heterosexuality. Physiologically and emotionally the child is not ready yet for love and desire; instead, fear of the penis, of being hurt, of being damaged, are the infantile manifestations of the awakening awareness of the other sex. If this fear is connected with guilt, it becomes the most important motivation for the girl's intense desire to be a boy, i.e., to want to possess the penis. This appears to the girl as the solution of all conflicts; were she a boy she would not be afraid of losing the mother's love, and she would not need to accept a sexual function in which satisfaction is connected with danger of suffering. Some girls may become quite obsessed with the desire of identification with the boy: they may become aggressive toward boys, others are satisfied just by imitating them. The fear of the feminine sexual role appears even more threatening to the little girl if the birth of a sibling occurs about the time of the oedipal development. If this situation arises, identification with the mother undergoes a severe test. At such a time the girl's identification with the mother has usually developed so far that she may fantasy having a baby of her own. The changed appearance of the mother, however, makes the girl realize that to be like the mother means changes of the body. The dangers of giving birth may become a source of worry and fear if the child actually did observe birth; even

³ Brunswick, R. M., "The Pre-Oedipal Phase of the Libido Development, *Psychoanalytic Quarterly*, 9, 293, 1940.

more, it may result in severe anxiety if the child's hostile impulses toward the mother and toward the oncoming sibling caused guilty feelings. Thus, the fear of pregnancy might become an important factor in interrupting the process of identification with the mother. If this conflict is sustained into adult age it becomes the most important inhibiting factor of sexual function as we see in cases of frigidity and sterility.

The developmental phase of the oedipus conflict implies a degree of psychosexual growth in which the two psychodynamic tendencies which motivate the sexual function in women—the heterosexual tendency and the passive-receptive tendency—become manifest for the first time. These tendencies directed toward the object world of the child—the heterosexual tendency toward the father, the passive-receptive tendency toward the mother—are antagonistic, and thus create a conflict. The same psychodynamic tendencies motivate the psychosexual behavior also during sexual maturity, when, as we shall see, hormonal regulation coordinates those tendencies into unified emotional behavior.

After the turbulent oedipal phase is mastered the *latency period* follows during which the mental and sexual growth dominates behavior while sexual behavior itself recedes in the background. Yet the plays, fantasies, and also the characteristic behavior manifestations of the child indicate to the observer what direction the psychosexual development had taken during the pre-latency period. In some girls the increasing dependence, attachment to the mother, is the unconsciously chosen defense against sexuality; in others the aggressive tomboyish attitude indicates a flight from femininity. Both of these main groups of character formations can be considered a normal variation of feminine development. They may be overcome in due time or may become the source of severe disturbance, depending mainly upon the girl's basic pre-oedipal relationship to her mother.

Universal is the girl's inclination to play with dolls. This activity gives the child opportunity to master by repetition her most important conflicts and to express her most dominant interests. Her motherly attitude toward the doll may express her own dependence on her mother: "I love my doll as I want to be loved by my mother." A hostile attitude toward the doll

might express the girl's hostility toward her sibling and/or toward her mother. It reveals, however, a more important conflict if it expresses a sense of insecurity in her mother's love and its meaning is: "I hate my doll and punish her as my mother hates and punishes me." Such play-acting may be a response to a superficial frustration or it may express a deep conflict which often can not be mastered either by repetition in play or by aggressive behavior. An unloved child feels unlovable; she often hates herself even more than she can afford to hate her mother and, as a result, we observe more or less severe forms of depression even in the latency period. Moodiness and crying, the lack of capacity to play are manifestations of depression in childhood although they are rarely recognized as such. It is important to note that depression in children often takes the form of psychosomatic disorder: overeating—*bulemia*—or lack of appetite—*anorexia nervosa*—are severe manifestations of the child's self destructive impulses and, at the same time, they represent aggression toward the mother. Somewhat less serious but belonging in the same category, are the nausea and vomiting which often occur in the morning; these symptoms usually serve to keep the child home from school, thus they afford gratification also for the dependent needs. Among other psychosomatic symptoms which occur in this age we may mention enuresis, asthma and skin-conditions. However, we emphasize particularly those in which eating—oral conflict—plays a role since they appear more important here not only because they reflect the primary role of the mother conflict, but also because conditions such as *anorexia nervosa* and *bulemia* obviously interfere with the further sexual development.

The end of the latency period is the developmental phase which H. Deutsch⁴ in her recent book described as *prepuberty*. It seems that this period represents a last stand, a last defense against the femininity which, however, will slowly win ground as the physiological process of maturation proceeds. This phase—from prepuberty to complete maturation—may take many years since there are often remissions in the physiological and emotional growth. These account for many a charming characteristic of this age and do not indicate necessarily

⁴ H. Deutsch, *Psychology of Women*, Vol. 1, Grune and Stratton, New York, 1944.

serious disturbances in those girls whose previous development was normal. In the early puberty it becomes obvious that the fate of the oedipus complex determines the further psychosexual development. Although the psychodynamic tendencies which form the oedipal conflict might have been dormant during the latency period, they are awakened early in puberty by the incipient hormonal function. The newly stimulated interest in the father is quickly overcome by the normal girl and her interest in the other sex is soon tried out in various attempts of approachment outside of the family. It is different in the neurotic girl; in her the heterosexual interest is accompanied by much fear of and hostility toward the mother. The threatening conflict with her mother increases the girl's desire to suppress her sexuality, thus it may arrest her further development causing various neurotic conditions. The psychosomatic symptoms of puberty, if they are not repetitions of the orally determined neurosis mentioned above, usually show a greater involvement of the heterosexual component: thus anxiety, phobic symptoms, vasomotor neurosis (blushing), menstrual disturbances are the symptoms which prevail during this period.

However, except in extreme cases, the physiological growth proceeds. The greater the girl's desire to fight its manifestations, the more sensitive she becomes to every change within herself. Although the responses have endless variations, they might be grouped around two basic factors: (1) With the developing hormonal function heterosexuality becomes an emotional reality for the girl. While she might have been vaguely afraid of men before, now she becomes afraid of her own desires and tries to suppress them. Defense against the heterosexual aspect of sexuality represents one group of the emotional manifestations of puberty. (2) The growing sexual function produces hormones which libidinizes the body; this the girl rarely can enjoy without shyness and embarrassment, emotions which she has to overcome in order to accept femininity, her body, and her genital functions in a positive fashion. While the girl fears heterosexuality and doubts her own capacity to attract men, her emotional needs find expression in enthusiastic admiration for women. In the identification with the idealized woman her fantasy allows her vicarious gratifi-

cations of beauty and love, and prepares her step by step for her later sexual role.

MENSTRUATION AND PUBERTY

Menarche—the first menstruation—may occur at any time during the period from prepuberty until adolescence. It is usually understood to be the sign of sexual maturity. Although this is not necessarily the case, the onset of the menstrual flow takes the central place among all events of puberty. The emotional reaction to it is usually quite marked. It is as if menarche were a puberty-rite cast upon women by nature itself; in all cultures it has been considered an exceptional condition. There is valid evidence to show that we look upon menstruation as the cornerstone of female development where sociological and physiological factors meet, marking the point at which adaptation to female sexual function may succeed or fail.

Anthropological studies of menstruation have dealt mainly with society's responses to and defense against the menstruating woman and they have shown that society—probably indicating man's society—is deeply afraid of the menstruating woman. It has often been demonstrated in the great variety of taboos and customs, that this fear on the part of society, whatever its unconscious motivation might have been, did necessarily influence the woman who menstruates, the girl who expects to menstruate. In primitive societies the girl has learned from her mother indirectly and by observation, that she will be excluded from society and that perhaps she will be regarded as a dangerous witch and this expectation certainly cannot remain without effect on the psychology of women. Although in our culture the taboo of menstruation is greatly decreased, menstruation is still surrounded with great secretiveness, which indicates the traces of taboos and superstitions of previous cultures. Besides the sociologically determined emotional factors there are also physiological motivations for the fear of menstruation. Menstruation is often painful; the fear of pain is deeply ingrained in physiology. The sight of blood might arouse not only the fear of pain but also it might stir up unconscious anxieties of mutilation, sickness, or even death. It was one of the early psychoanalytic observations that women connect menstruation with the idea of mutilation in their

fantasies and dreams; they dream about bloody acts which they commit or which are committed on them. This type of anxiety dream seems to confirm the psychoanalytic concept that for women menstruation means the loss of penis, and thus appears to be a satisfactory explanation for the fact that the first menstruation is usually experienced as a trauma.

The emotional difficulties characteristic of puberty, however, neither represent nor are caused by emotional reactions to menstruation alone. Individuals whose menarche came late, at the age of 14-17 years, may have emotional difficulties characteristic of puberty long before menarche; others whose menses began early do not show these emotional manifestations immediately; even though they may have reacted to the menstruation with aversion and distaste, their emotional puberty develops only later. The previous psychosexual development determines the emotional response to menstruation just as it affects the other manifestations of the unfolding puberty. If the previous psychosexual development had been burdened with anxiety and guilt feelings, the developing sexual desires may exacerbate anxiety and the defense against sexuality may grow. This defense may be expressed as a desire not to be like the mother. One of the most frequent symptoms of adolescent behavior is the girl's hostility toward the mother. It is she whom the girl blames for all the difficulties of her adjustment to the sexual role. We pointed out previously that the mother's personality, her capacity for love, for acceptance of sexuality or her defensive, punitive attitude in this respect, influences the daughter's identification with her in the early stages of the development. During adolescence, while the girl struggles with her awakening sexuality, all these factors come into play more forcefully than before. If the identification is successful the girl becomes capable of accepting her own heterosexual tendencies without fear or defense; and she will be able to accept menstruation without undue protest or regression. If the process of emotional maturation failed the rebellion against the mother continues as a protest against menstruation as well as against other aspects of femininity. Thus, it may develop an incapability of the woman to accept her sexual organs and sexual function with pleasure and this may lead to inhibition and suppression of the organic function of sexual-

ity; and frigidity, functional sterility, menstrual disturbances, as well as obesity may ensue.

THE OVARIAN FUNCTION

The function of the ovaries is to produce the germ cells—ova—and the regulatory hormones by which reproduction is brought about. It is undecided when this activity begins. Although recent investigation indicates that around the age of three to four years, children of both sexes excrete masculine and feminine type hormones—estrogenic and androgenic substances—it is assumed that the ovaries are dormant until the beginning of puberty. On the other hand, there is evidence that estrogenic hormones are produced before the cyclic function develops completely. Maturation may be only partial for some time even though menstruation may occur with more or less regularity.⁵

The physiological cycle of the ovaries begins with the ripening of the follicle; this process produces the follicular hormones—*estrogens*. When the follicle reaches its maturity, lutein cells appear in its wall and the production of the second ovarian hormone—*progesterin*—begins indicating the preovulatory phase; this normally ends with the rupture of the follicle: the ovum escapes its covers and is ready to be fertilized. The cells which originally shaped the wall of the follicle form, after the ovulation, the corpus luteum which produces progesterin. The maximum functional capacity of the corpus luteum is usually attained in about a week after ovulation. After this period, if pregnancy does not occur, the corpus luteum begins to degenerate, the progesterin production diminishes and completely disappears. As a result of this, the uterine mucosa which was prepared for the reception of the fertilized ovum by the effect of the progesterin, breaks down and the menstrual flow starts; this ends the cycle. Usually, however, during the time of degeneration of the corpus luteum, new follicles begin to enlarge, of which one may be destined for the next ovulation. Thus the cycle repeats itself.

The cyclical function of the ovaries governs the behavior of the females of lower mammals causing periodic receptivity—heat or estrus—at specific intervals peculiar to the species. In hu-

⁵ Allen, Dauforth, Doisy, *Sex and Internal Secretions*, Williams and Wilkins, 1939. R. G. Hoskins, *Endocrinology*, W. W. Norton and Co., New York.

mans the operations of these factors are not obvious since the primary biological tendencies are disguised by cultural patterning as well as by modifications due to interpersonal relationships. In spite of this, close observations have revealed that the course of emotions related to sexuality in women is under the controlling influence of the ovarian activity. In a series of investigations the state of ovarian function was established by examination of daily vaginal smears in a group of women during the course of their psychoanalytic therapy.⁶ On the basis of interpretation of dreams and fantasies and other emotional manifestations the phase of the ovarian function was inferred. When the two sets of independently achieved data were compared a definite correlation was found between the ovarian function and the emotional state. Briefly these investigations showed: (1) During the follicular ripening phase, paralleling the estrogen production, an active sexual energy dominates the behavior and brings forth libidinous demands in order to seek contact with the sexual object. As in the lower mammals so in humans the estrogens were likewise found to be playing the basic role, namely to bring about sexual activity. (2) When progesterone comes into effect the direction of the psychosexual energy changes; it becomes directed toward the woman's body as a passive-receptive tendency. The effect is a generalized erotization; the woman appears relaxed, her readiness to receive the male is usually conscious, while the desire for impregnation and for pregnancy is usually expressed in dreams and fantasies only. When preparation for motherhood becomes the goal of the hormone function which parallels the progesterone production, the emotional preoccupation with motherliness becomes manifest.

THE SEXUAL CYCLE

The evolution of the ovarian cycle forces the emotional processes of an adult woman into regulated channels. Beneath all the complex superstructure of human personality there is an ebb and flow of physiological stimuli which directs the sexual needs of woman. This cycle begins with the gradual production of estrogen and parallel with it develops the active sexual tendency, the object of which is the sexual

partner and the aim, coitus. The estrogenic phase is usually accompanied by a sense of well being and alertness. The normal manifestations of heterosexual tendency need not be discussed here. They are easily recognizable in dreams and fantasies, in conscious emotional attitudes as well as in behavior. If the desire is not satisfied, the emotional tension may increase; restlessness and irritability are often signs of thwarted sexual urge in adult women. For the psychologist it is important to recognize the heterosexual tendency in its disguises as it appears in inhibited individuals; then, parallel to the increasing hormonal production the characteristic defense against sexuality can be observed; in infantile persons anxiety, in others, increasing hostility may cover up the heterosexual tendencies.

About the time of ovulation the active sexual energy fuses with the passive receptive tendency and thus creates the highest level of psychosexual integration, i.e., the biological and emotional readiness for conception. If gratification is impossible the increased physiological tension stirs up the suppressed conflicts, which may be expressed through dreams and fantasies, as well as by conscious emotional attitudes, and/or through symptoms. Thus in enhanced libidinal readiness, or, if this is thwarted, in the increased emotional tension, we may recognize the preovulatory phase.

After ovulation occurs the tension is suddenly relieved and a period of relaxation follows. Nothing is more likely to reveal the new phase of the sexual cycle than the psychic apparatus which at this time expresses the emotional reaction to the biological task of reproduction. This is induced by progesterone. While the action of the corpus luteum increases a period comparable to the quiet period in lower mammals develops and lasts for several days. The emotional concern shifts to the body and its welfare. The psychological material corresponding to this period might be summarized as preparation for motherhood. This may be expressed as a wish for or fear of pregnancy, or as a hostile-aggressive defense against it. Analysis of this material usually reveals the striving for identification with the mother; desire for motherhood appears in the psychoanalytic material at the height of the progesterone production and usually indicates developmental resolution of the conflict with the mother. If this level of emotional maturity

⁶ Therese Benedek and Boris B. Rubinstein, "The Sexual Cycle in Women," *Psychosomatic Medicine Monograph*, Vol. III, 1942.

is not achieved the psychoanalytic material reveals the protest against mother identification. Conflicts with the mother and/or with the child then dominate the psychological material which may be expressed with great emotional tension or by depression.

Upon the decline of progesterone production the *premenstrual phase* follows. This is often signaled by the reappearance of heterosexual tendency corresponding to the incipient maturation of new follicles. The physiological process taking place in the uterus as well as the emotional manifestations indicate the preparation for menstruation. Parallel with the diminishing hormone production regressive tendencies motivate the emotional behavior. This may account for the fact that the premenstrual phase is often described as the recurrent neurosis of women. Very few women are completely free from mood changes and from discomfort during this part of the cycle. The symptom manifestations show great variation. Apprehension of what will happen to one's body, fear of mutilation, recurrence of other infantile sexual beliefs may give rise to anxiety, excitability and to rage-reactions. In other cases, fatigue, crankiness, sensitiveness to being hurt, weeping spells indicate a calmer but not much more agreeable condition. The generally increased excitability of the nervous system—a reaction to the relative ovarian deficiency of this phase—may be responsible for the fact that in these days all needs and desires appear imperative, all frustrations unbearable; the emotions are less controlled than at any other time during the cycle. It is as if the ego, deprived of some of its controlling functions, is permitting repetition of emotions experienced by the individual during her oedipal and puberty development. The end of the sexual cycle is marked by menstrual flow which, ushered in by a sudden decrease of hormone production, continues for several days. Soon after the flow is established the tense and fearful mood relaxes, the excitability decreases. It seems that adult women accept the menstrual flow with emotional relief. The clinical picture of premenstrual depression usually prevails longer than the other premenstrual symptoms. Although this may be explained on a purely hormonal basis, it is interesting to note that the psychological material can be interpreted as regret over failure in achieving pregnancy. Women then often recall sad experiences, abor-

tions and death; they depreciate themselves and the female genitals which they feel are worthless, and complain about menstruation which is regarded as superfluous, senseless, dirty. This depressive mood usually continues until the new estrogen phase re-establishes itself. After a few days, normally during the flow, the estrogen development begins, and parallel to it a state of well being arises with this, a sexual stimulation suggesting the beginning of the new cycle.

This is indeed a schematic account of the psychic and somatic evolution which constitutes the sexual cycle. Since stimulating and inhibiting factors assert their influence continuously on the sexual development as well as on the mature individual the sexual cycle shows not only characteristic variations in its pattern, but also changes in one and the same individual. The most obvious characteristic of the cycle is its length, that is, the interval between the menstrual flow. The average length is 28 days; some women menstruate in 21–23 day intervals, and others, also within the range of normal, have cycles of 32–35 days duration. There may be variation in the time of ovulation, as well as in the relative frequency of ovulatory cycles—i.e., cycles in which ovulation fails to occur; obviously this is an effect of inhibitory factors. Most revealing for the pattern of the hormonal cycle is the intricate relation between the two phases, estrogen and progesterone, of the cycle. The balance of these two phases determines the length of the cycle and time and duration of the menstrual flow as well as the existence or lack of some symptoms.

Progesterone is the specifically female hormone; while estrogen may be produced in variable degrees from childhood on, progesterone develops only after puberty as a function of the ovum. Its appearance indicates sexual maturation; its physiological and psychodynamic effects are responsible for the cyclical changes. It is therefore understandable that its relation to estrogen production, its deficiency or preponderance, characterizes the variations of the cycle. Here we would like to reiterate that the emotional expression of the progesterone is manifested in feelings related to motherhood, which in their psychological genesis depend greatly upon the girl's relationship to the mother from earliest infancy until maturation. Thus investigation of hormonal cycle as well as psychoanalytic in-

vestigation of the developmental factors revealed that there is a definite inter-relationship between psychosexual development and the hormone cycles. While the pattern of the hormonal cycle unfolds concomitantly with those factors which determine the psychosexual development, the psychodynamic course of the cycle seems to repeat this development in condensed form again and again under the control of the hormonal cycle. Thus the sexual cycle represents in its manifestations, a psycho-somatic unity the function of which is to prepare the woman for her reproductive role.

PREGNANCY

When the aim of reproduction is achieved, and conception has taken place the cyclic function of the ovaries is interrupted for the duration of pregnancy and it is not reestablished with regularity until after the lactation is finished; then the mother's physiological task with one child is accomplished and the cyclic function begins to prepare for the new offspring. Pregnancy, physiologically, is an extremely complex process; it is normal and, at the same time, an exceptional condition which often tests the physical reserves of the woman. Therefore it is not easy to decide which of its accompanying symptoms are purely organic and which may be emotional in origin.

There is not much known about the psychology of pregnancy. Whether or not there is a genuine physiological need directing the woman's desire for pregnancy has been only rarely discussed in the psychoanalytic literature. For a long time Freud's hypothesis that childbearing represents a substitute for lacking masculinity was generally accepted. However, what has been indicated with regard to the development of female sexual function justifies the assumption that the psychodynamic tendencies which prepare for reproductive function represent a genuine quality of the female psychosexual anlage. Observations on little girls, their enthusiastic interest in living toys,—cats, rabbits,—their play with dolls or with their siblings express motherly attitudes earlier than the controlling hormone function develops. Until the woman achieves full functional maturity the primary motherliness may be interwoven with many complicating factors; thus the primary desire for the child—the psychic representation of a biological need, can not be easily demon-

strated. As long as gratification of the biological need for motherhood is fulfilled without interference of human controls one can rarely study the primary psychological factors involved in childbearing. Women, overburdened by childbearing and by the ensuing responsibilities, often complain; although their relationship with their children may be genuinely motherly, the pregnancy appears to them as a function forced upon woman by nature and by man. Only if the satisfaction of childbearing is denied to them does the wish for the child become manifest and the pregnancy desirable. In such instances, whatever the reason of sterility may be, the sense of frustration may change the natural desire for motherhood to a clamoring obsessive demand which becomes the representation of all the combined frustrations of a lifetime; thus, they prove but little about the primary need for motherhood. There is a large experiment going on in our civilization: birth control. Since child bearing became dependent upon individual decision there is better opportunity to observe the genuine response to the physiological conditions of preparation to childbearing. Many women postpone childbearing voluntarily on account of various considerations. These women are not sterile. In such cases we may observe the variety of emotions, the desire and the frustration which occur when the pent up physiological preparation is useless and the emotional tide of motherliness recedes; in the repetition of this process, we may recognize the factors which may lead to sterility and those which become finally satisfied by pregnancy.

The most-often-occurring disturbance of the early phases of pregnancy is the so-called "morning sickness," nausea and vomiting, which may be occasional or persistent. It is interesting to note that this condition does not occur so often nowadays and that, when it does, it is only rarely with the severity hitherto observed. Nausea at the beginning of the pregnancy usually is the effect of the hormonal unbalance. It is not necessarily a sign of rejection of the child and is much more easily overcome if the woman accepts her pregnancy than if she clings to every discomfort in order to prove that she has to suffer from her condition. A placid self-centered contentment is the characteristic emotional attitude in pregnant women and this is observed in spite of transitory complaints, especially in young women. Even women who

were usually tense, nervous, excitable or even accustomed to having anxiety states are surprised about their gratifying calmness during pregnancy. Achievement of this state probably accounts for the willingness to bear children, even in the face of all discomforts. The modern woman who chooses to be pregnant is naturally more aware of this gratification; at least she expresses it more articulately. During pregnancy the woman enjoys the gratification characteristic of the progestin phase of the cycle many times multiplied. Responsible for this is the increased hormone production; added to it comes the fact that during pregnancy the environment also permits readily the self-centered attitude and even favors various kinds of regressive infantile demands of the woman. While she is permitted to have specific gratifications, the regression itself has a function: it seems to pave the way for the mother's emotional identification with her infant. The passive-receptive identification with the child is one of the psychodynamic sources of the mother's tenderness toward the baby; for the mother, the baby is just a part of her loved self during pregnancy and after parturition only slowly does the infant become an object of love, separate from herself.

The physiological preparation for childbearing is the same for children of both sexes, its emotional concomitants naturally have to be the same for the child of either sex. Folklore, however, always tried to predict the sex of the yet unborn baby from the behavior of the pregnant woman. Her symptoms, her facial expression, her carriage and many other things were held to be predictive of the sex of the child to be born. Although statistical investigations would not confirm such assumptions, the fact that these superstitions developed has a psychological significance. It indicates a general awareness for differences in the mother's emotional attitude corresponding to her expectation, to her wish or fear in regard to the sex of her child.

In our civilization, woman's desire to give birth to a boy has many motivations. It is a manifestation of society's evaluation of the male sex, and hence it is not surprising that women may strive with great desire to fulfill it. But more in keeping with woman's emotional needs are other motivations: the love of the husband, the desire to reproduce him or to produce what he values the most, are the healthy motivations

for the desire of having a son. These motivations do not cause the desire for a son to be exclusive. The wish for the son becomes dominant when the woman is afraid of having a daughter. Woman's awareness of or sensitivity to repetition of emotional situations is deeply ingrained. Trained through the monthly rhythm of psychic and somatic events she unconsciously expects repetitions. This may reinforce her apprehension that the struggle which once she had with her mother will be repeated in her daughter's relationship with herself. If her own conflicts have been resolved she is ready and willing to accept her child regardless of sex. The dominance of the wish to have a daughter may likewise have several determinants. It may be that the identification with the daughter appears to the woman easy and without conflicts; or that she may be afraid of her conflicts with a son. Hostility toward the male sex as well as fear of her sexual responses may cause a woman to dread an outbreak of her conflicts if she had a son, and so she might have an exclusive desire to have a daughter. In neurotic women apprehension about the sex of the oncoming baby may become very severe during pregnancy. Fear of the inability to love the child engenders feelings of guilt even during pregnancy. This may cause severe anxiety, and depression. In some cases these feelings may be warded off until parturition. Then the pain and suffering during delivery, the fear that she might have died, may activate and reinforce hostility toward the child. The sudden change in the hormone household is another factor favorable to depressive emotional states. The young mother who expected to be happy in her motherliness finds herself fatigued and lacking emotions; this alone is a disappointment which usually is overcome in a few days, when the young woman, loved by her husband, recovers from the physiological "let down." If the disappointment about the sex of the infant is added to this depressive state, the hostility toward the child may become manifest. In severe cases, fear of this hostility and guilt about it may cause depression or psychotic reactions. But in most cases, we observe only a more or less serious rejection of the child. In such fashion is the seed of the neuroses of the new generation planted. It is not our intention to describe here motherliness and its manifestations. However, it must be emphasized that the mother's life

encompasses her children, not only in the routine of everyday life. In this close interrelation the mother relives her own emotional needs, also her own conflicts—and thus, she determines the emotional development of her children.

The psychodynamic conflicts which force a woman to fear her sexual function may influence reproductive capacity in various ways. (1) In cases of chronic deficiency of the ovarian function the emotional attitude remains infantile and inhibited. These women usually fail in getting sexual partners. (2) The woman's total personality remains sexually attractive but her orgasmic capacity is inhibited; she may be completely or partially frigid. The signs of emotional frustration are more obvious in the latter than in the former deficiency. Orgasmic capacity is not a prerequisite for ovulation and for perfect reproductive function. (3) Functional sterility is a condition caused by other than anatomical disorders. Although we assume that in these cases the primary emotional conflict resulted in the fear of pregnancy and hostility toward a child, the desire for the child may remain active and alive; these women suffer from a sense of severe frustration if their attempts to become mothers fail. The desire and the failure puts the woman under a strain of an emotional vicious circle which is apt to intensify psychosomatic conditions. Several cases have been reported in which this vicious circle was interrupted; the women became capable of having their own child after one was adopted. This indicates that, after the women were able to overcome the fear of a child, their reproductive function recovered.

THE MENOPAUSE

The active, reproductive period in women lasts some thirty-five years. At about the age of forty-seven, on the average, it comes to an end, and with it menstruation disappears.

Menopause can be induced artificially by removal of the ovaries. In young girls such an operation interrupts the further sexual development but does not cause the characteristic symptoms which occur if the ovarian function is interrupted suddenly in a woman of childbearing age. The symptoms in the latter can be alleviated by substituting hormones. This can be taken as proof that the disappearance of the hormones causes the symptoms of menopause.

These symptoms vary greatly. The average healthy person, especially if she has had several children, will notice only moderate discomfort, while women whose sexual life was unsatisfactory and who did not have children may suffer more acutely. In such cases it often appears as if the ovarian function instead of slowly abating becomes irregular and the hormonal unbalance is then the cause of the severe symptoms of climacterium.

The symptoms of the menopause are psychosomatic. The hormonal regulation fails and with it signs of irritation of the sympathetic nervous system occur: irritability, restlessness, insomnia, and various manifestations of vasomotor lability are the most common symptoms. The well known hot flashes are sudden vasodilatations accompanied by discomfort. The intensity of these symptoms, as well as the woman's immediate responses to them, depends mainly upon her total personality. This will decide whether she can accept the new phase of her life gracefully or whether she will rebel against it in a futile struggle. The expectation of the "change of life" plays a great role in woman's life, and it often troubles her emotions even as early as in her late thirties. While the manifest behavior shows only a fear of becoming old, a more detailed psychological observation reveals a repetition of the emotional struggle she had against menstruation during adolescence; this time, paradoxically for the purpose of holding on to a function she once feared and detested. This shows the emotional over-evaluation of the menstruation itself. Since it was the sign of maturation when it came, its disappearance not only indicates to the woman that she cannot have children any more, but it also activates the fear that she cannot have sexual gratification any more. This, however, is not necessarily the case. A considerable amount of eroticism may persist after climacterium depending mainly upon the totality of libidinal experiences and practices throughout life. A well-balanced, well integrated personality takes climacterium in her stride; her emotions are established in her family, in her community group, in creative activities for which she can strive even more energetically after her reproductive task is finished than she did before; these gratifications will enable her to rise above the regressive phenomena which makes this period of life so critical for neurotic women.

We have described in detail the emotional manifestations accompanying the low hormone level during the premenstrual-menstrual phase of the cycle. The menopause is merely the repetition of that, only more severe, since the hormone decline will not be relieved in a few days. Hence the depression as well as the sense of frustration becomes more painful, the regressive manifestations—corresponding to the decreased hormonal function—more lasting. One example of this is that women of this age indulge in eating and gain weight. Emotionally, the woman's capacity to love, to be interested, to concentrate may decline. Physiological signs of the lacking estrogen function may develop also; some women may experience a slight degree of masculinization; the voice may become deeper, hair growth on the face or on the legs may become marked. Again it depends on the personality of the woman to which aspect of the decline in herself she may respond with deep dissatisfaction, with the feeling: "This should not happen to me." Such disappointment in oneself engenders inferiority feelings, and self accusations which form the core of the emotional disturbance in climacterium. In many instances they are overcome by the existing productive aspects of the woman's life; if not, they may develop into more or less severe depression. It is generally known that so-called "high strung individuals" are more apt to have severe symptoms during climacterium than others. The reason for this is: a "high strung individual" is one who cannot take frustrations. At climacterium, however, she is faced with a double frustration; she senses her declining functions and she is aware that gratification from the external life may be limited or thwarted. If she has not already learned to adjust herself to such events, the climacterium concomitant with a regression of sexual functions may reactivate those conflicts which were important in earlier developmental phases, thus engendering turbulent emotional situations. Ordinarily the woman adjusts readily to one set of frustrations, even if sometimes the adjustment takes longer and is at the cost of some changes in personality. Only if external disappointments occur at a time when the woman in awareness of inner decline feels incapable of mastering the situation, does she become seriously ill. Normally, however, women adjust to this change of life and continue a

well integrated socially productive life for many years, long after the reproductive function has been terminated. Women's life expectancy is, after climacterium, longer than that of men in the corresponding age group.

SUMMARY

The woman's life—more markedly than the man's—is divided into periods which are defined by her reproductive function. The first period lasts from infancy to adolescence. During this, the relationship to her mother will determine the development of heterosexual attitudes and the emotional acceptance of the propagative function. The second is the reproductive period. From menarche to menopause, in cyclic intervals the woman gets ready for conception, failure of which results in the menstrual flow. From one menstruation to the other evolves the sexual cycle, during which corresponding with the hormonal stimulation, is repeated the rise and decline of emotional integration of the psychosexual maturation. After a child is born the mother's psychosexual life is partially externalized, it encompasses the child. With the daughter, more directly than with the son, the mother repeats those emotional attitudes which originally determined her own emotional development. Living her life with her children again gives the woman the chance for final personal integration in mature motherliness. The accomplishments of the reproductive phase will determine the manifestations of the climacterium and also her emotional life after the menopause.

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PSYCHOSOMATICS.—*Definition:* The term "psychosomatic" implies that either in the observable manifestations or in the constructed motivation of healthy or pathological functioning a correlation can be established between "psychological" phenomena, such as reactions of fear or outbursts of anger, on the one hand, and either functional or irreversible structural alterations, such as rapid heart rate, peptic ulcer or brain damage, on the other.

The term "psychosomatic medicine" was coined in 1939 at the time the *American Journal of Psychosomatic Medicine* was founded. It is obvious, however, from its problems and methods that psychosomatics represents a syn-

thesis of several streams of psychological and medical investigation.

BASIC CONCEPTS AND THEIR DEVELOPMENT

Function of the Brain—Clinical and Post-Mortem Observations—Experiments. One of the basic ideas in psychosomatics is the correlation between the psychological functions and the functions of the brain. This is equally fundamental in establishing relation between brain damage and psychosis, as in general paresis; or between stresses of life situations and bodily illness, such as hysterical paralysis or bronchial asthma. The reaction to life stresses takes place in the patient's brain, where the chain of events starts—nervous impulses, metabolic effect—which finally lead to bodily illness.

The Function of the Brain. The clear establishment of the functions of the brain and its parts occurred rather late in the development of science. It was based partly on correlating clinical and post-mortem observation, which was becoming a general research procedure in medicine. The cerebral hemispheres are "the principal seat of the immediate cause of sleep, of dementia, of apoplexy, of melancholia and of mania." This was the conclusion of Rolando (1808). In another part the development was based on experimentation, namely, the removal of various parts of the brain by operation, followed by observation of the functions of the surviving animal. "The functioning of the cerebral lobes is willing, judging, remembering, seeing, hearing—in a word, perceiving." If the lobes are removed, the animal may lie still until it dies of starvation. He is blind and deaf. These were some of the observations and conclusions of Flourens (1822).

Reaction Time—Speed of Conduction of the Nerve Impulse. A stimulus (e.g., light) is presented to the subject, who is instructed to signify with a simple movement, e.g., raising a finger, the instant he perceives the stimulus. The time elapsing between the giving of the stimulus and the movement made in response to it is the reaction time.

On a nerve-muscle preparation of the frog, the nerve is stimulated electrically next to the muscle, and the time elapsing between the stimulus and the contraction is measured. Then the nerve is stimulated at a point farther from the muscle, and again the time interval is measured. The difference between the two intervals

gives the time it takes the nerve impulse to travel the distance between the two points on the nerve. A man's reaction time is measured by giving an electric shock to his foot. His reaction time is measured again, now giving the electric shock to the upper part of his thigh. The difference between the two reaction times gives the time it takes for the nerve impulse to travel the distance between the two points.

These observations by Helmholtz (1850), although methods as well as results have become more complex since, represented a turning point in man's approach to the functioning of the nervous system. They represented an experimental and quantitative method proving the existence of measurable physiochemical processes in the nervous tissue, thus giving concrete body to the idea of psychophysical correlation.

Relationship Between Intensity of Stimulus and Intensity of Sensation. A screen is illuminated with a hundred candlelights. The subject is instructed to state if and when he notices an increase in illumination. It is then found that an increase of one candlelight is necessary for the subject to notice an increase in the intensity of light. If the screen is illuminated with two hundred candlelights, an increase of two candlelights represents the minimum noticeable difference.

Experiments of this type were first done by Weber (1834) and then later, in great detail, by Fechner (1860). It was Fechner who formulated his results as the "law of psychophysics," stating that geometric progression in the intensity of the stimuli is paralleled by arithmetic progression of intensities of sensory experience. This quantitative formulation holds more or less accurately only for the middle range of intensity and does not hold for very intense (or very weak) stimuli. This procedure represented another important quantitative experimental step toward the exploration of the relationship between "psychological" and physical processes.

Recording Bodily Changes During Emotional Reactions. Changes in the volume of the extremities depend mainly on the relative filling of the blood vessels. If the blood vessels (mainly arterioles) contract, the volume diminishes. Such volume changes can be recorded by enclosing the extremity, airtight but not under pressure, in a glass tube. The extremity communicates its changes of volume to the air in

the tube, and changes are recorded graphically by a tambour.

If a relaxed subject is asked to perform some task under pressure, particularly if his anxiety is aroused that he might fail at the task, a diminution in the volume of the extremity can be observed as registered by the plethysmograph. This type of experiment was first performed by Mosso (1884). Similar experiments were performed on changes in pulse rate (acceleration) and on blood pressure (rise) by Lehman about the same time (1892). These developments went hand in hand with the accurate methods of observation in medicine and the developments of instruments for the recording of bodily functions in illness. The experiments here mentioned represented another very significant step in the attempt to correlate psychological and physiological events and give the latter quantitative expression. The general tendency here described found a crystallized and systematic expression in the establishment of the first psychological laboratory by Wundt (1879).

THE PROBLEM OF THE PART AND THE WHOLE

Localization of Motor Function in the Cortex of the Brain. It was stated in the previous section that Flourens correctly observed and concluded "The functioning of the cerebral lobes is willing, judging, remembering, seeing, hearing—in a word, perceiving." He assumed, however, that the cerebral lobes performed these functions as a unity and that there was no further differentiation in them as regards function and localization. It was not long after, however, that further differentiation was proved in the central nervous system.

The first such development occurred on the basis of clinical and post-mortem observation. It was found that a man who could use the musculature of his articulatory organs for other purposes, and who was intelligent enough to speak, nevertheless was not able to speak. He had lost this ability thirty years before he died of a gangrene. On post-mortem examination, a lesion was found in the third frontal convolution of the left cerebral hemisphere. Broca, who made this discovery, considered this area a distinctly localized motor speech center (1861).

Additional proof of more distinct differentiation was furnished by experimental investigation. If the animal's brain is exposed and the

cortex is stimulated with a relatively weak electric current, an area is found in the anterior central gyrus, the stimulation of the various points of which produces isolated muscle contractions in various parts of the body. Thus respective areas can be found for the muscles of the arms, the legs, the neck, and the face. (Fritsch and Hitzig, 1870.)

Broader View of Localization—Disturbance of Function Is Complex. Similar areas of localization were found for vision, hearing, perception of tactile stimuli. The tendency then predominated to consider these various areas as functioning independently of each other and to consider the functions as distinct isolated faculties. The formulation as regards speech defects then was that there is an entity of motor aphasia (the individual understands speech fully but is not able to speak), auditory aphasia (the patient hears what is said to him but does not know the meaning of words), alexia or visual aphasia, consisting of the defect in understanding written language, and agraphia (the defect is in the ability to write). Further investigation, however, showed that this was not a correct formulation either. It was found that no case of aphasia ever presents circumscribed speech defects. Varying defects of all forms of speech exist in every case, though one form usually predominates. Nor is the defect limited to speech, but is likely to affect other areas of function. For example, in one form of aphasia the individual can speak but is unable to organize words into a correct sentence. An individual with such a difficulty may lose his sense of direction and be unable to plan how to get from one place to another. (Head, 1923.)

Thus, on the basis of the findings mentioned, it was obvious that the complex synthesis has to be effected between the function of the isolated parts and the function of larger complexities, that is, the function of the whole. On this more sophisticated level, the concept of unity was revived.

Concept of Units of Function in Psychology. A similar development took place in psychology and psychopathology. At one period the prevalent assumption was that the unit of psychological processes was the "idea." Ideas are such things as are "expressed by the words whiteness, hardness, sweetness, thinking, motion, man, elephant, army, drunkenness, and others." If we can divide what we know consciously at

any given time into components, we have ideas. Ideas become combined with each other. This is what is meant by association of ideas. Ideas are built up out of sensations. The laws of association are similarity, contrast, and contiguity. (Plato, 438 B.C.; Aristotle, 340 B.C.; Locke, 1690.)

Faculty psychology also represented an approach characterized by the assumption of distinct and separate phenomena, although grouped into broad categories. The three main faculties of the mind were (1) cognition: sensation, perception, thinking; (2) feeling: being pleased or pained; and (3) conation: willing and acting.

A combination of the physiological and psychological unit approach is characterized by the assumption that the reflex, particularly the conditioned reflex, builds up even the most complex psychological behavior. (Pavlov, 1903; Watson, 1916.) A simple reflex is a muscular or glandular reaction to a simple stimulus, the impulse being conducted by way of the reflex arc, consisting of at least one afferent and one efferent neurone. The conditioned reflex is a reflex occurring in response to a substitute stimulus as a result of experience. In the former the cortex of the brain is never involved. In the latter it is almost always involved.

Concept of Patterns and of Personality in Psychology. All of these observations represented important advances and led to significant experimental and practical applications. The broader approach is represented by the assumption that psychological events are interrelated and occur in patterns ranging from simpler to greater complexity. The complex or total reaction contains principles which are not contained in the details alone. (Wertheimer, 1912; Köhler, 1917; Koffka, 1921.) Such a principle is illustrated, for example, by the figure-ground relationship. Thus, if there are a lot of varicolored dots on a page, and a group of them all of the same color and in close proximity form the shape of the figure 4, then this latter pattern stands out as the figure and the rest recedes into the background. A simple action, such as raising one's arm, can be looked upon in a similar manner. The action forms the dominant event, but in addition to that, the rest of the body musculature is so contracted as to form the proper condition of balance, the background, for this event.

The general investigative effect of this ap-

proach is that many aspects of clinical and experimental situations are observed and evaluated and relationships established. Returning for a moment to the behavior of brain injured patients, the following can be observed: Patients with severe brain injuries get visibly disturbed and may tremble all over if they fail in solving a task such as an arithmetical problem. As a result they may lapse into complete unconsciousness. Such a patient may try to defend himself against the onslaught of any task or stimulus with which he cannot cope. As a result he may shun the company of other people, he may constantly engage in self-chosen activities, and he may develop excessive orderliness so that he will not get confused by the problem of where to find things and how to utilize them. Thus all these symptoms can be explained on the basis of a total personality reaction—wanting to escape distressing, perplexing situations. (Goldstein, 1918.)

Broadening of Concepts in Psychiatry—Psychoanalysis. In psychiatry, the development toward broad and embracing concepts is represented first by the approach of classifying disorders in larger categories instead of isolated symptoms. In contrast with viewing various disorders as circumscribed disturbances—e.g., the patient having a delusion of sin and guilt (the patient has the delusion that he has committed the unpardonable sin)—broad disturbances of many aspects of his functioning became grouped together—e.g., under the concept of manic-depressive psychosis. This disorder, then, is characterized by recurring periods of depression and/or elation. In the former, the patient is depressed, is slow in his thinking, speaking, and acting; he is constipated, he loses weight, and has feelings of worthlessness and guilt, often with delusions. He has a dry mouth with a slowed secretion of saliva. In the manic phase, he has flight of ideas, he is overactive, talkative, excited, elated, witty, and often irritable. He may be self-aggrandizing with delusions of grandeur. (Kraepelin, 1896.)

Psychoanalysis, with the method of free-association and dream analysis, established the relationship between a wealth of psychological details manifested by the normal or the sick individual. This integration was accomplished through the concepts of dynamic strivings. This can be illustrated in connection with the manic-depressive psychosis discussed above. The de-

pressive phase of this psychosis has similarities to the normal phenomenon of mourning, in which a love object is lost, and the individual finds it difficult to detach himself from, and go on functioning without, the love and support of the lost one. In depression there is also such a loss, not necessarily in actuality but psychologically. The patient, however, makes himself responsible for this supposed loss because of his hostility toward the love object on whom he is emotionally dependent. The feeling of guilt and worthlessness comes from these qualms of conscience. The elation in the manic case is the opposite of depression. It is an attempted solution of the pain and suffering of the depression. The patient is in flight from, and throws off, his conscience. To accomplish this, he of course has to over-reach himself, and the elation represents the great relief from the burden of suffering and an enjoyment of all the forbidden and feared strivings which the patient had previously kept in check. (Freud, 1916.)

REACTIONS TO LIFE SITUATIONS

Brain Lesions and Toxic Processes. It has been said in the first section that psychological phenomena are to be considered as functions of the brain, the latter involving secondarily the rest of the body. Therefore, "introspective" and "physiochemical" events in the organism are to be considered different manifestations of the same process. The modern concept of "psychological" reactions includes both manifestations. Of necessity, introspective experiences—e.g., experiences of fear, fantasy, being hurt—are obtained and communicated by different methods than observations of "objective" phenomena—e.g., increase in heart rate or running away from a situation. The two types of data are correlated with each other and organized into such concepts as reaction pattern and personality.

It is obvious that the nature of these events is quite different both as to quality and as to determination if the event is initiated by gross structural lesion in the brain or the introduction into the organism of a toxic substance, on the one hand, or such events as a threat to life or loss of a loved one, anxiety and mourning, on the other. It is traditional in medical history to speak of the former as organic and of the second as psychogenic. Aristotle (340 B.C.) observed that the individual often manifests little

fear in situations in which one would expect him to react with great emotion, and at other times reacts with strong manifestations of great fear or anger with little provocation. He attributes this to differences in the state of the body. He also observed that at times the individual manifests and experiences fear when there is no objective reason for it. He relates this to mental causes. The relative emphasis on these two approaches to psychological and somatic phenomena is an old one.

The problem continues up to the present day and can be traced through the development of medicine. The statement, "Every mentally ill person is also physically ill" (Friedrich, 1839), implied that the ultimate cause of mental diseases is in the bodily pathology, particularly that of the brain. This approach led to the first appearance of the term "somatopsychic" medicine. (Jacobi, 1838.) The other orientation spoke of the "psychophysical totality of man." "Whenever abnormal psychic manifestations are present, we deem it a mental disease. It has its roots in the psyche insofar as the latter uses sense organs. It is also rooted in the body insofar as the latter is the organ of the psyche." (Feuchtersleben, 1838.) This author maintained that the consideration of psychological factors is of much greater value than apothecary mixtures.

Cause and Treatment of "General Paresis." In the development of psychiatry, both approaches have made great causative and therapeutic contributions. An example of the primary and predominant "somatic" causation is general paresis, which is due to syphilis of the brain. It was first concluded on the basis of case histories that this was the situation. Then the presence of *treponema pallidum* was demonstrated in the brain. (Noguchi and Moore, 1913.) The illness was almost universally fatal within a year and a half after its inception. The illness has become treatable with the induction of malarial fever paroxysms (Wagner-Jauregg, 1918); in two-thirds of the cases the patient either fully recovers for practical purposes or improves sufficiently to return to social existence. Even in general paresis, of course, there are "psychogenic" determinants in the symptomatology. Thus the delusions of grandeur observed can be considered as partly determined by a reaction to the failure of some of the directly damaged functions such as memory and reasoning, and

further to the previously unconscious trends toward self-aggrandizement which in turn were based on feelings of worthlessness, rejection and failure and in part represented restoration of the infantile omnipotent outlook on the world.

The Neuroses. The primary psychogenic approach made its great causative and therapeutic contribution to the disturbances commonly referred to as neuroses. The most important and influential development in this direction was psychoanalysis. It was discovered that neurotic reactions had a "meaning," that is, they were translatable into common, everyday psychological terms. They were the manifestations of largely unconscious processes—that is, of attitudes, impulses, strivings—which the subject did not know and of which he was afraid and did not want to be aware. These conflicting impulses could be characterized as pleasure striving, fear, hostility, conscience, ideals, guilt, dependency needs, and need for self-esteem. The difficulties were traceable to both developmental and current conflicts. If, in the process of the therapeutic relationship, the patient could be made aware of his unconscious reactions, he could relieve his conflicts with a new and favorable solution, his reaction patterns changed, and his neurosis was cured. (Breuer and Freud, 1893; Freud, 1906.)

Of course, the patient who exhibits neurotic reactions suffers from physiological disturbances of more or less the whole organism also. Constipation, diarrhea, rapid heart rate, cold extremities, diminished activity because of fatigue, inadequate sexual performance influence in subtle ways the general metabolism and circulation. In extreme instances, neurotic hyperventilation—continuous deep breathing—may lead to such diminution of the CO_2 content of the blood as to result in alkalosis and tetany. The latter consists of sustained spasms of the upper and lower extremities. (Talbot, Cobb, Cooms, Cohen, and Consalazio, 1939.)

Combined Approach. There have been attempts made in research to combine both approaches in investigating the combinations of bodily types and mental traits, together with tendencies toward types of mental disturbances. Thus three types were differentiated: "pyknic," "asthenic," and "athletic." Pyknic type is characterized by overweight, large round chest, and short neck; the asthenic, by underweight and flat chest; the athletic, by long limbs and well-

developed muscles. Patients with manic-depressive psychosis are more often pyknic; those with schizophrenia, asthenic. (Kretschmer, 1925.) Similar is the grouping established on the basis of standard photographs of the three views of the naked subject: of "endomorphism," "mesomorphism," and "ectomorphism." Endomorphism is the dominant component in soft, round people with big viscera (jolly, fat man); mesomorphism, that in those with much muscle and bone (burly athlete); ectomorphism in those with leanness, fragile bones, large skin surface and brain (nervous bookworm). (Sheldon, 1940.) A more circumscribed relationship between toxic reactions and neurotic reactions to life problems is illustrated by this observation: asthma (attacks of difficulty in breathing) is often maintained in response to life stresses in individuals who manifest altered reactivity to certain substances, e.g., to contact with animal hair or ingestion of milk.

RELATIONSHIP BETWEEN ORGANISM AND ENVIRONMENT

Reactions of the organism always have to be described in the type of environment in which they are being studied. (Lewin, 1936.) Certain processes occur in the organism regardless of the type of environment, although they change depending on the environment. Other phenomena occur only under certain environmental conditions. The metabolic changes in the organism occur under all circumstances, and in vertebrates oxygen is consumed. These processes may vary tremendously in heat or cold, during activity and rest. One would assume that breathing movements would have to occur as long as the organism is alive. However, if the subject is placed in a chamber in which the air pressure varies ± 55 mm. mercury around the atmospheric pressure twenty to thirty times per minute, adequate gas exchange takes place without lung movement, and the respiratory movements cease. Under different circumstances, of course, the cessation of respiratory movements would be accompanied by alarm. Under these circumstances, that reaction is absent. (Thunberg, 1924; Barach, 1940.)

The standardization of experimental stimuli is necessary in exact experiments. However, the significance of an environmental situation (stimulus) for the organism may differ from individual to individual or even for the same

individual at different times. Food or sex situations have different values for the organism when it is in need of satisfaction and when it is sated. A sudden sound is a different stimulus for one who works daily with comfort in a noisy place than for one who, as a result of traumatic experiences, starts violently at any unexpected noise. There is enough uniformity in a large series of stimulus situations for most individuals to make experiments with identical stimuli statistically significant. A more effective way, whenever possible, is the use of situations, varying if necessary, which have similar significance for different individuals. Thus, interviews touching on emotionally charged life situations are the best means of inducing stress in the experimental subject. (Mittelman and Wolff, 1939.)

INTEGRATION OF MULTIPLE FACTORS

Psychobiology. It has been stated that some pathological processes start with lesions in the brain or toxic processes in the body, but there are evidences of total personality reactions to the disease process also. In other pathological processes the disturbance starts with stress reactions to life situations and there are evidences of disturbance in physiological economy of the organism. In some pathological processes the general make-up of the organism or some biochemical experience seems to facilitate the development of disturbances of certain types. It has further been stated that manifestations, observationally or experimentally circumscribed, have to be brought into relationship with other manifestations of the organism; further, the functions of the organism have to be viewed in their environmental setting.

A convenient way to list the various causative factors in illness and to give rough, relative, quantitative significance to them is to assign zero to four plus to genogenic (hereditary), histogenic (caused by visible lesions), chemogenic (toxic, or deficiency of some agent), and psychogenic (reaction to life situations) factors.

A woman with a healed abscess of the brain began to have convulsions. Considering her very difficult home situation she was treated psychologically, and stopped having convulsions. Obviously in this case the psychogenic factor was as important in maintaining the illness as the histogenic factor. (Cobb, 1944.)

The most comprehensive synthesis of both

normal and pathological phenomena is represented by the concepts of psychobiology. The organism reacts to life situations as a dynamically integrated whole. The nature of the reactions is determined by the individual's personality, the situation, the individual's constitutional make-up, and past experiences. The function of the vegetative organs is part of the total reaction. Characteristic psychopathological conditions, such as manic-depressive psychosis or schizophrenia, are to be viewed as "reaction types" determined by the above integrated factors. (Meyer, 1905.)

PSYCHOSOMATIC METHODS OF INVESTIGATIONS AND RESULTS

Reactions to Life Situations—Clinical Observations. In clinical observations, the investigator interviews the patient frequently, observes the latter's behavior, and records his introspective experiences occurring in response to day-to-day events including the therapist's person and comments. Constructions based on these observations are "tested" over a long period of time on the basis of the patient's reactions to new events as well as his reactions to the constructions conveyed to him by the investigator. The problems handled are complex, and it would be difficult to create uniform experimental situations and to reduce the variables sufficiently to handle them with formal statistical procedures. These observations and constructions acquire regularity by the repeated occurrence of the same sequence of reactions in single patients as well as in several patients manifesting similar symptoms. In the course of the evolution of psychoanalysis, correlations were observed between various psychological and psychopathological phenomena on the one hand and bodily complaints and observable changes in the bodily function on the other.

Anxiety and Changes in Bodily Function. A correlation was observed between anxiety reactions and the following physical complaints or observable phenomena: fast beating of the heart, excessive sweating, diarrhea, vomiting, dizziness, trembling. The correlation is based on the following types of observation: The phenomena occur simultaneously with the experience of anxiety, or the phenomena occur in the same individual in situations in which usually attacks of fear occurred—e.g., in a wife after disapproval by her husband or after inter-

rupted sexual intercourse—or it is observed in some individuals, without experience of anxiety occurring at any other time, in situations in which other patients usually experience anxiety. (Freud, 1892.)

Pleasure Strivings and Guilt and Changes in Body Function. It was observed that together with the arousal of certain predominantly repressed strivings and fantasies certain bodily changes occur. Oral erotic desires, or disgust in reaction to them, may be correlated with choking sensation in the throat, coughing, and vomiting; genital excitement and desire for masturbation with bed-wetting; desire to bear a child with abdominal pain and enlargement due to accumulation of gas. These connections are traceable to childhood interests and experiences. The bodily symptom represents a disguised gratification of the forbidden desire as well as self-punishment resulting in suffering as a result of guilt. (Freud, 1905.)

Relationship Between Hostile Reactions and Changes in the Body Functions. It was observed that attacks of asthma may occur parallel with conscious or unconscious reactions of anger. Such reactions may occur in dreams of violence (Dunbar 1938, Deutsch 1939, French 1939). Arterial hypertension may be correlated with sustained hostility. (Alexander, Saul, 1939.)

Inter-Human Relations, Personality Traits, and Bodily Functions. Two types of relevant observations are significant. (a) Certain character traits may be patterned after various physiological functions. Dependency and the desire to be taken care of are patterned on the desire and pleasure in being fed, as the infant is cared for. Stubbornness or miserliness may be patterned on the stubborn desire to retain the bowels, or cleanliness and meticulousness as a reaction formation to the desire to play with excreta as a result of strict and premature training in cleanliness. (Freud, 1908; Abraham, 1924.)

(b) The individual's self-evaluation and his evaluation of the environment is determined by life-experience, particularly by the vicissitudes (anxiety) of his relation with other individuals from infancy to adulthood. Such vicissitudes are frustration, rejection, being made to feel worthless, and being made to obey without reward. The personality traits resulting from these may be a boundless desire to be looked after and submit, to dominate, oppress, and hurt other

people, to excel all others, or to be independent and reject love. (Adler, 1912; Freud, 1926; Fromm, 1936; Horney, 1937; Kardiner, 1937; Rado, 1939). The disturbed function of the organs may be an expression of these strivings or may occur concomitantly with the reaction of fear, anger, and guilt if the strivings are thwarted. Thus a hard driving, emotionally detached man may develop gastroduodenitis and peptic ulcer when he fails in his enterprise and in addition feels unsupported by his wife whose affection he himself had rejected. The gastric disturbance (over-function) represents an expression of the desire to be fed (Alexander, 1934), an attack on the frustrator, a feeling of being counter-attacked in a helpless state, guilt and a plea for mercy. (Mittelman and Wolff, 1940.)

Three important concepts in clinical thinking are those of helplessness, conflict, and "internalization." Helplessness implies a feeling of catastrophe in case of anticipated abandonment or anticipated attack. Conflict implies the existence of clashing strivings in the individual leading to sustained tension. "Internalization" implies the acceptance by the individual of the demands and restrictions of the environment finally as dictates of his own conscience and as his own ideas. Lastly, the clinical approach considers the individual as a whole in relationship to the environment.

Life Situations and Precipitation of Illness. In reviewing the patient's life and his illness, a temporal relationship can be found between stresses of life situations and periods of suffering. In a large number of patients, life crises—e.g., death in the family, separation, occupational failure, marriage—precede the onset of the disturbance; in others, a sustained situation of stress obtains—e.g., marital unhappiness, discrimination, disappointment in the children. The effects of such situations are cumulative and when the patient reaches the limits of his endurance or loses hope of betterment, the illness begins to dominate the picture. These relationships may be presented graphically in the Life Chart by putting side by side in chronological order major life events and manifestations of illness. (Meyer, 1905.)

EXPERIMENTAL OBSERVATIONS

Emotional Reactions and Bodily Changes. The concept of an emotional reaction implies

(1) the individual perceives something in the environment; (2) he has an introspective experience; (3) there are concomitant bodily changes; (4) an alteration in his behavior follows. This last alteration may be merely an impulse or it may be paralysis. Vegetative changes may be concomitants of an intense conscious experience. At other times strong conscious experience may occur without much concomitant change or the change may occur without conscious experience. Such techniques as free-association and dream analysis may be needed to adequately clarify the reaction. Further, the dominant vegetative reaction, e.g., gastric or circulatory, may vary from one individual to the next with similar introspective experience. Thus emotional reactions cannot be equated merely with a vegetative change.

Physiological changes that occur during emotional reactions occur also during physical alteration in the environment or during muscular activity. Thus, a rise in pulse rate, fall in finger temperature, rise in blood pressure, increase in sweat secretion and respiration occur both during physical exercise and during emotional stress (anger, anxiety), as well as during such a complex experience as sexual orgasm. It is understandable for this reason that in individuals with personality disturbances the symptoms may appear during physical exercise or during changes in the physical aspects of the environment. Thus, severe attacks of palpitation and rapid pulse, as well as pain in the region of the heart, may arise regularly connected with emotional stress during muscular effort. Individuals with a tendency to cold extremities connected with emotional stress may suffer badly on account of the cold extremities in cold weather.

Vegetative changes during emotional reactions occur simultaneously in several organ systems. Thus during lying (fear of detection) there is increase in sweat secretion (psychogalvanic reflex), rise in blood pressure, and alteration in the rapidity and shape of respiration. Experimental observations of the functions of various organ systems will be presented in connection with special syndromes. Here the changes in the sweat secretion of the palm of the hand (psychogalvanic reflex) will be discussed, a function which has been recorded in a large variety of standardized experimental situations.

The Psychogalvanic Reflex (PGR). The psychogalvanic reflex consists of lowering of skin resistance during emotional reactions due to increase in sweat secretion. One electrode is placed on the palm of the hand, the other on the forearm. The change in skin resistance is measured on the basis of the movement of the galvanometer needle while an unchanged amount of electric current is flowing through the body. (Féré, 1888.)

In the course of three sittings, 13 subjects were presented 150 stimulus words intended to run the gamut from very pleasant ("darling," "vacation") through indifferent ("basket," "make") to very unpleasant ("suicide," "vomit"). After each stimulus word, the subject reported its pleasant or unpleasant effect on him, using a five-point scale. Meanwhile a galvanometer was registering PGR (Dysinger, 1931). Pooling the results from the 13 subjects (so far as comparable), the PGR was smallest, on the average, when the stimulus word was "indifferent," as seen from the mean PGR readings:

Effect of Stimulus:

Very Pleasant	129
Pleasant	98
Indifferent	79
Unpleasant	101
Very unpleasant	147

SD_M for these values is about 6; the unit is arbitrary.

It seems that PGR may occur during any kind of emotional reaction but is liveliest during startle or "tension." (Landis and Hunt, 1935.) The increased PGR with either pleasantness or unpleasantness is particularly interesting and parallels some observations on other vegetative phenomena.

There is no adequate formulation as regards the difference in the total organismic reaction during unpleasant experience, e.g., fear and anger, on the one hand, and satisfying and pleasurable experience on the other. The difference may be in the total constellation of vegetative, and at present unrecordable, phenomena in the nervous system. An important difference between healthy and pathological reactions may further be in the intensity and the duration of the reactions. Satisfactory pleasurable experience and passing fear or anger are ultimately followed by relaxation and reestablishment of homeokinesis (homeostasis). In severe enough anxiety states and states of resentment and

frustration, such restitution never adequately follows.

In a series of experiments, repeated startle was produced in subjects by loud, rough noise on successive days. It was then found that on successive days during the anticipatory period, i.e., after the electrodes were applied and the subject was waiting, the skin resistance was progressively higher. In other words, anticipatory tension, and with it the sweat secretion, on successive days, was progressively less. The reaction to noise was present on each day, but also diminished progressively. (Davis, 1934.) These experiments illustrate graphically how the organism adapts itself to a new situation, the vegetative reactions lessening with diminishing anxiety.

Patients suffering from various psychoses manifest a diminished psychogalvanic reactivity both to relatively neutral (e.g., "What day is it today?") and to crucial ("Do you hear voices?") questions. In this respect a record can be considered abnormal if no reliable PGR is elicited by fifty per cent or more of the questions asked. In a series of 100 psychotic patients studied, eighty per cent showed such deviation. The incidence was highest among catatonic schizophrenics (maximal withdrawal from the environment). The deviation was also present in manic-depressive psychosis and general paresis. (Hoch, Kubis, and Rouke, 1945.) Resistively hostile as well as perplexed and evasive patients often show a transient rise in systolic blood pressure in response to questions when there is no psychogalvanic response. This indicates that there is an alteration in the autonomic balance (see later) during psychosis—not simply a general absence of response. (Solomon, Darrow, and Blaurock, 1939.) Adequate PGR reappears in patients who recover from their psychoses.

The combined effect of physiological and emotional stimuli on the reaction of the organism is illustrated by the following observations. If drugs are given to diminish sweat secretion (atropine), the PGR is diminished or abolished. In conditions like hyperthyroidism accompanied by excessive sweating, the skin resistance is lowered.

Electroencephalography—Sleep. Electroencephalography is the recording of currents that are obtainable through electrodes attached to the skin of the skull or to the brain. They are

produced by electric activities of the brain. (Berger, 1929.) Thus it is possible, although in a limited way as yet, to record changes, correlated with psychological phenomena, in the nervous system itself instead of merely in the peripheral organs such as blood vessels or stomach.

Dreams indicate that during sleep introspective experiences continue, but self-criticism and repression are diminished. Thus impulses, attitudes, conflicts, emotions, and memories become revealed which are kept from awareness in the waking state. The psychosomatics of sleep is as yet little known. There is more blood in the brain, the temperature of the body is lower, the muscles are relaxed, breathing is periodic, and there is an increase of carbon dioxide in the blood. The depth of sleep is paralleled by the changes in electric phenomena produced by the brain.

A subject with electrodes attached to the scalp is put in a situation conducive to sleep and the electrical potentials produced by the active cells of the cerebral cortex are recorded on a continuous moving paper for several hours, while the subject goes through various phases of sleep. A large proportion of normal persons show regular ten per second waves (α waves) when fully awake but with eyes closed. When drowsiness or the "floating state" sets in, the ten per second rhythm becomes less regular and as light sleep comes on the waves may group themselves into spindles with spaces between, where waves are small or absent. As sleep deepens, some slower waves appear (six per second), and in really deep sleep long, slow waves replace the faster rhythm. In the deepest sleep, even these tend to disappear and the electroencephalogram is almost a base line with a few small waves. Sudden awakening immediately brings back the normal rapid rhythm associated with alertness.

Subjects in sleep are still able to discriminate between stimuli. It has long been observed that a mother will wake at the slightest cry of her child when much louder noises do not seem to disturb her. In harmony with this, loud automobile noises outside the house had no effect upon the electroencephalogram of a sleeper, while a slight noise in his room, especially the slight snap made by pressing an electric switch, would start a change in the sleep waves toward the waking type.

Hypnotic Blindness. In normal waking state, ten per second waves are usually present if the subject has his eyes closed. They disappear if he opens his eyes in the light. The subject of the experiments to be reported was a patient who had been frequently brought under hypnotic suggestion for therapeutic purposes. When he was hypnotized, he still showed his normal waking (electroencephalographic) record, with no indications of the changes characteristic of sleep. The hypnotist suggested to the subject that he was blind and could not see. Although the eyelids of the subject were held open by adhesive tape and the room was illuminated, the alpha waves appeared in the electrical record. The hypnotist suggested that the patient had regained his vision; the alpha waves promptly disappeared. Sight and blindness were suggested alternately 16 times, and each time the EEG showed a corresponding change. The changes were essentially the same as if the subject had actually opened and closed his eyes. (Loomis, Harvey, Hobart, and Davis, 1936.)

Epilepsy, Psychopathic Personality, Passive Dependent Trends. In all of the applications mentioned, the EEG was correlated with transient psychological phenomena. In other applications, however, some permanent features in the EEG have been related to the tendency of the individual organism to react in certain pathological ways. Normal EEG's exhibit either eight to twelve per second (α waves) or 16 to 30 per second (β waves) rhythm. In epilepsy, the EEG may show bursts of "spike and dome" or of low frequency high amplitude waves between overt attacks or before attacks have yet occurred. More difficult to evaluate are some findings in behavior disorders in children (Jasper, Solomon, and Bradley, 1938), and "psychopathic personality." The latter condition is characterized by superficial emotional attachment, impulsive behavior, lack of sense of responsibility, and often aggressive or criminal behavior. About fifty per cent of patients in these groups show slow (five to seven per second) waves scattered through the EEG. (Hill and Watterston, 1942; Simons and Diethelm, 1946.)

Although open to debate as yet, a further development in the methodology of utilizing the EEG in psychosomatic investigations is illustrated by the following:

The α index expresses the percentage of α rhythm in, let us say, a two minute run of

EEG. This is fairly constant for a given individual. The term "dominant" α rhythm was applied to runs in which 75 to 100 per cent of the waves are of the α type. By evaluating the subject's dreams as indications of his bent for "activity" or "passivity" a correlation could be established between high α index and "passivity" on the one hand, and low α index and "activity" on the other (Saul and Davis, 1937). It was found that 71 per cent of 100 patients with peptic ulcers and 60 per cent of 45 patients with bronchial asthma (see both later) exhibited "dominant" α indices. The incidence of dominant α index in unselected "normals" is 20 per cent. In both the above conditions, reactions to frustrated dependency longings play an important role in the dynamics of the illness. (Rubin, Bowman, and Moses, 1944.)

Hypnotic Experiment. Experiments with hypnosis are particularly instructive, because they can produce alterations in body function of such types as are observed in sick individuals.

The subject is asked to fix an object with his eyes while the experimenter keeps repeating, "Your eyelids are heavy and droop"; "You breathe calmly and deeply"; "You are relaxing"; "You are falling asleep." Some subjects go into a sleep-like state in a few minutes, whereas others do so only after several prolonged trials. Perhaps only about 10 per cent of the population responds easily. Deep hypnotic trance is usually followed by spontaneous amnesia. (Mesmer, 1766; Braid, 1843.)

Pulse Rate and Metabolism; Unconscious Processes. Subjects were hypnotized, their pulse rate and metabolism recorded. After a control period, individually meaningful harrowing experiences were suggested to them while pulse rate and metabolism were being recorded; e.g., a woman who was much attached to her mother was told that she and her mother were separated in a forest during a storm. There was a rise of about 27 in the pulse rate per minute and of approximately 20 per cent in the metabolism. She was then told that after waking from the trance she would forget the experience, but that her reaction would be revived when the experimenter took a handkerchief out of his pocket. In the post-hypnotic waking state, whenever the experimenter took the handkerchief out of his pocket her metabolism and pulse rate rose without conscious anxiety and without her knowing why (Deutsch and Kauf,

1923). Rise during fear was confirmed by other investigators, who also found that depressive, elated, or irritable moods, induced in hypnosis, were not accompanied by a rise in the basal metabolic rate. (Whitehorn, Lundhold, and Gardner, 1929.)

Catalepsy. The production of cataleptic rigidity in a somnambulistic state is a commonly observed phenomenon. The subject is told that he will hold his arm in a certain position, and he then proceeds to do this very long beyond the possible limit of waking fatigue.

Paralysis and Aphonia; Circulatory Changes in the Skin. Hysterical phenomena such as paralysis of an extremity or aphonia (ability to talk only in whispers in the absence of structural damage to the vocal cords or the motor nerves) can be made to disappear and reappear in hypnosis. This was first done by Charcot (1890). These experiments involved muscles with voluntary innervation. Even more dramatic were his experiments with hypnotic influence on autonomic functions such as circulation of the hand. Dr. Levillain, of Paris, records a case where Charcot is said to have produced the *aedeme bleu des hysteriques* by suggestion. The subject was told that her hand would swell, become blue, and turn cold. The hand increased to nearly double its former volume and presented all the appearance of "blue edema"; its temperature fell 3° C. lower than the rest of the body. Suggestion quickly caused the symptoms to disappear.

Skin Blisters. The subject is put into a deep hypnotic state. His skin is then touched with an object, e.g., a pencil, and the suggestion is given that the object is a red hot iron. There is an immediate circulatory change and some hours or a day later a blister forms at the site where the burn was suggested. This blister, on microscopic examination, shows the same histological changes as a blister actually caused by a burn. The course of healing is also the same. (Doswald and Kreibich, 1906.) Such experiments are not successful with every subject who is put in a deep hypnotic state.

Emotional Stress and Lowered Resistance to Infection. Several patients suffered from periodic attacks of small blisters around the mouth (*herpes labialis*). It was found that these attacks followed reactions to situations of stress. These patients were hypnotized when they were free from blisters; and severe, emotionally

traumatic events (for example, death of the fiancé) were discussed with them. After the trance the patients always developed blisters.

The experiment was carried further. The contents of the blisters were transferred to the eye of a rabbit. The fact that the rabbit developed small blisters and then ulcers on the cornea proved that the contents of the blisters contained germs. (The germs that are responsible for *herpes labialis* have not yet been identified, but the infectious nature of the condition can be proved in this way.) (Heilig and Hoff, 1928.)

Past Experience and Psychosomatic Illness. In some subjects the following experiment is possible. The subject is told in deep hypnotic state that it is his fifth or sixth or third or tenth birthday. In many subjects then, it can be observed that their reactions and their behavior are largely commensurate with their development at the age stated. Thus the infantile reactions, walking on all fours, taking objects into the mouth, and sucking their thumbs, appear.

In some subjects an even more unique and circumscribed preservation of memory of events can be demonstrated. Let it be assumed that it is known that when the subject was five years old, he had severe attacks of hives (urticaria). He is given the suggestion that he is six years old. No change occurs in the skin. Then he is given the suggestion that he is five years old. The subject then complains of itching and soon hives appear on the skin. He is then told that he is four years old; the hives disappear. He is again told that he is five years old and the hives reappear.

LARGE-SCALE AND RAPID METHODS OF SURVEY

Three methods have evolved for large-scale and usually rapid survey of psychosomatic manifestations in sample populations or in studying reaction patterns in individuals with certain types of somatic disorders.

(1) *Brief Psychiatric Interview.* The interview covers in three to fifteen minutes most important personality and psychosomatic disturbances. It involves indispensable questions such as, "Have you ever had a nervous breakdown?" "Do you have bad stomach trouble?" "Were you ever badly depressed?" "Did you ever have fits or convulsions?" At the same time, as much freedom and informality is al

lowed as compatible with the brief period allotted to the interview. The final results are then classified on the basis of dominant symptomatology and further on the basis of presence and intensity of symptoms. An illustration of the results with such a method is given on 450 unselected admissions to medical and surgical hospital wards. Forty-five or 10 per cent were appraised as having severe personality disturbances, and ninety or 20 per cent as having moderately severe personality disturbances. (Mittelman, Weider, Brodman, Wechsler and Wolff, 1945.)

(2) *Rapid Test Procedures.* The Cornell Index, in its short form, consists of 62 questions. Half of them concern bodily complaints. Some of the questions aim at ascertaining the presence or absence of very severe symptoms, such as peptic ulcer or convulsions. Other questions aim at milder symptoms, such as dizziness or

palpitation. The Cornell Word Form is a less direct method, aiming at the same goal. It consists of a series of stimulus words, each followed by two words from which the subject is asked to choose the one that "goes better" with the stimulus word, e.g., "HEAD: mind, hurt." The choice "hurt" suggests the symptom of headache. Either of these test blanks can be completed by the average literate person in five minutes, and it can be scored in half a minute. The results can be used either qualitatively or quantitatively. In the latter case a certain number (or more) of "symptomatic" replies is taken as indication of personality or psychosomatic disturbance.

Both of these tests have been validated against psychiatric interviews. (Weider, Mittelman, Brodman, Wechsler, and Wolff, 1945.) The following table illustrates the results found in validating the Cornell Index:

Incidence of "Stop Questions" * Among the General Selectee Population, Those Accepted or Rejected by the Interview Method in New York and Boston, and Those Discharged by the Army and Navy Because of Performance and Neuropsychiatric Disability.

	"Stop Question"	General Selectee Population 1,000 cases	Accepted by Interview Method at Induction 887 cases	Rejected by Interview Method at Induction 113 cases	Discharged by Army and Navy Because of Performance and Neuropsychiatric Disability 282 cases
	No.	%	%	%	%
Alcoholism	5	0.7	0.1	5.7	10.4
Headache	10	8.7	5.3	35.4	48.7
Fits	15	1.8	0.8	9.7	18.0
Drug Addiction	20	0.8	0.7	1.4	3.8
Stomach	30	7.5	5.9	20.4	19.3
Enuresis	40	3.0	0.8	11.0	7.3
Stay in Mental Hospital	45	0.7	0.2	4.4	11.7
Sleep Walking	50	1.0	0.6	4.4	5.5
Severe Diarrhea	55	2.1	1.4	8.0	9.3
Nervous Breakdown	59	0.7	0.2	4.4	33.9
Peptic "Ulcer"	60	0.4	0.2	1.4	8.3

* "Stop Question" refers to those questions which aim at severe symptoms.

(3) *Study of Standardized Psychological and Behavioral Items.* In this method of procedure, items like educational level, kind or severe parents, overt irritability or calmness are routinely checked and evaluated in one or two interviews. The relative frequency of various types of items

is then compared as it occurs in groups of patients with various disorders. As an illustration the following findings are given: Patients who are admitted to the hospital with fractures have been found to have in general a lower educational level than patients who were ad-

mitted with disease of the coronary artery of the heart. Secondly, it has been found that fracture patients in a larger percentage than coronary patients do not finish the school period that they have undertaken. (Dunbar, 1943.)

These results imply varying personality traits for patients who develop varying illnesses. Many individuals try to solve conflicts through getting out of the situation or through impulsive action. Such action may result in fracture. It may even represent a suicidal attempt, in that the patient unwittingly exposes himself to an accident. Other individuals try to solve their conflicts through insistent and consistent pursuit of goals. They use their aggressions, which they keep under control, for the purpose of getting themselves accepted through achievement and by coming up to expectations. Patients with coronary disease show a tendency in this direction. The strain that this behavior puts on the vascular system and the heart contributes to the causation of the ultimate illness.

The large-scale methods establish certain common features presented by a majority of a group of subjects and in this sense are essentially statistical. The particular individual may be totally different in his reactions from the general trend. Some accident prone patients not only have finished college but are superior in their achievements and follow their goals with dogged consistence. Further, accidents resulting in fractures may be due to the patient's fault or to somebody else's fault. Large-scale surveys identify mainly trends that are significant enough to show in the final results in spite of all the variables encountered.

Sexual and Ethnic Differences in the Incidence of Psychosomatic Disorders. A review of the incidence of perforated ulcer at the New York Hospital from 1880 to 1900 revealed that women had perforated ulcer at least as commonly as men, i.e., 6:7. (Mittelman and Wolff, 1940.) All perforations in these patients were visualized either at operation or autopsy (all autopsies from 1880 to 1891). Beginning in the period of 1901 through 1906, the ratio of males to females changed. The following figures were found for the years 1901 to 1939:

	Males	Females	Ratio
1901-1906 (5 years)	10	4	2½:1
1907-1914 (7 years)	55	9	6:1
1915-1930 (15 years)	260	16	16:1
1931-1939 (8 years)	36	3	12:1

Similar changes have taken place in Germany, France, Scandinavia and the English speaking countries. (Jennings, 1940.) Such change may have been due to the shift in the self-esteem-dependency conflict in the relationship between men and women as a result of the historic, economic, and cultural events.

Coronary disease of the heart is more common among men than among women. Arterial hypertension is rare among the Chinese. The explanation may be that both of these illnesses are favored by hard-driving work. The incidence of exophthalmic goitre on the other hand is higher among women (5:1), due either to endocrine differences or to women's greater demand for dependency and the resultant fear of, and resentment at the thought of, frustration and abandonment.

THE RORSCHACH TEST

The Rorschach test consists of ten standardized inkblots. The subject is asked to tell what he sees in them. The mode of response to the blots tends to be characteristic of the deep personality configuration of the person making the response. (Rorschach, 1921.) The value of the test in psychosomatics is illustrated by the following examples: Patients with an organic lesion of the brain tend to see very few things in the blots and to base their responses largely on shape rather than color or a sense of movement. They are typically perplexed by the task although they make an effort to comply. They tend to repeat the same answer regardless of changes in the contours of the blots. The reactions typical of such patients have been so well studied that it is often possible to make a diagnosis from the Rorschach in advance of conclusive neurological signs. (Piotrowski, Harrower, 1940.)

The test reveals characteristic personality types for various psychosomatic conditions respectively, e.g., rheumatic disease, hypertensive cardiovascular disease, coronary occlusion, fracture (accident proneness), migraine, etc. (Kemple, 1943; Ross, 1945). Such differentiation depends not upon the appearance of special signs for each condition, but rather upon indications of the whole personality complex in the test results. Patients with rheumatic disease are often seen to be passive, masochistic, infantile individuals. Hypertensive patients are characteristically more ambitious for power, with more

conscious hostility and a constant conflict between aggression and passive dependency needs. Patients suffering from migraine show persistent effort toward success, perfectionism, inflexibility, conventionality, and intolerance, with difficulty in sexual adjustment. Fracture patients must be subdivided into three groups: the "introversive" who tend to seek satisfaction within their own emotional and imaginative experience; the "extratensive," seeking satisfaction through traffic with the outside world; and the "constricted," who attempt to repress all spontaneity of feeling and experience. All of the groups show a strong effort to compromise between passivity and aggression, with emphasis on self-determination, independence of authority and on day-to-day pleasures.

ANIMAL EXPERIMENTS

Transient Reactions (Acute Experiment). The multiplicity of psychosomatic reactions is particularly well illustrated in the following experiments. A cat was tied to the experimental table and the pulse rate, blood pressure, presence of sugar in the urine, and the motility of the gastrointestinal tract, as well as its circulation as judged by the color of the guts while exposed, were observed. Then a barking dog was brought into the laboratory. As a result of this, the heart beat of the cat became rapid, the blood pressure rose, the gastrointestinal activity diminished, the color of the guts became paler, and sugar appeared in the urine. (Cannon, 1915.) If the sympathetic nerve supply was severed, the reactions still occurred though less intensely. If the sympathetic nerve supply to the adrenal gland was severed, the reaction did not occur. Thus the conclusion was warranted that this reaction was mediated through the sympathetic nervous system as well as through the outpouring of the adrenal secretion. The experiment was more successful with female cats than with male cats. The reason was that the female cats, being less excitable, were able to relax while tied to the experimental table, whereas the male cats were in a continuous state of low rage, and therefore the introduction of the barking dog did not have such dramatic effect. This observation about the complex effect of the sex gland and the emotional reactivity of the organism is in harmony with the general observation of the excitability of stallions and bulls. The organismic and en-

vironmental approach of Cannon also is illustrated by his constructions based on this experimental observation. His assumption is that these changes represent measures on the part of the organism to deal with an emergency situation. The increased blood supply to the muscles, together with the mobilization of the sugar, the increase in the heart rate, diminutions in the activity of the gastrointestinal tract, all prepare the animal for his struggle and enable him to fight better.

Method of Conditioning. A dog, who was operated on so that the excretory duct of the parotid gland opens on his cheek, stands on a platform with slings under his fore- and hind-legs which prevent him from moving away. The receiving tube is gummed to his cheek over the opening of the duct. The experimenter lets a metronome sound, say at 130 ticks per minute, for just a few seconds and then food is presented. The time during which the metronome ticks (before food) is gradually increased to ten, fifteen, twenty, or thirty seconds. After ten or fifteen trials, the conditioned response essentially a psychosomatic reaction is well established, in that saliva is secreted during the beating of the metronome, the conditioned stimulus, before food is presented. The response includes the motor reaction of turning toward the source of food and incipient chewing movements. If the metronome is now made to beat at ninety ticks per minute, saliva is secreted. If, however, in further experiments, the 130 rhythm is regularly followed by food, the ninety rhythm is not, the animal finally differentiates between the two and secretion occurs only on the 130 rhythm. (Pavlov, 1900.)

In his formulations of his fundamental findings, Pavlov took mainly the coupling of the conditioning stimulus and the response into consideration. "Under suitable conditions, a new connection must be formed at the very first occurrence of the stimulus excitation, and this becomes strengthened by every repetition." He further formulated his results in terms of two opposite factors, excitation (resulting in secretion) and inhibition (cessation of secretion). He observed some other features of the conditioning experiment which he did not utilize in his formulation. He noticed that for a successful experiment the dog must be taken for a walk before the experiment, be given a drink of water, be hungry, wide awake, and alert,

free from any painful or irritating stimulus and well-adapted in advance to the laboratory, the apparatus, and the experimenter. On the basis of these additional data it can be said that the animal becomes adjusted to the new situation and reacts meaningfully to a significant stimulus. The unconditioned stimulus becomes a "signal" (Pavlov at times used this term himself) of the biologically important facts of the environment. The animal has to be hungry, otherwise the presentation of food has no meaning for him. The concept of "adjustment" has the implications of being safe, cooperative, and able to concentrate on a task.

"*Experimental Neurosis.*" Pavlov also made the first observation on "experimental neuroses" in animals by means of the conditioning method. This topic, together with further broadening of the scope of observation will be discussed in connection with the following experiments.

The sheep or lamb selected for conditioning must at first be caught and forced into the laboratory. It is usually necessary to lift the animal on to the table and tighten the loops under the legs to prevent escape by struggling, lunging, crouching, and jumping. Within a few days or weeks, *opposition changes to willingness*. The sheep is more easily caught in the barn, stands quietly while a chain is fastened around its neck, and now it leads the experimenter from the barn to the laboratory, often tugging at its leash. Mounting the inclined platform to the table, it eats from the bucket of oats and allows the loops to be adjusted without struggling. It stands quietly when food is taken away, and even when the loops are removed from the limbs.

An electrode is bound to the sheep's foreleg near the shoulder and electric shocks of moderate intensity are applied. A few seconds before each shock, a metronome begins to tick and it keeps on till the shock arrives. As the experiment proceeds, a diffuse conditioned response, struggling, agitated breathing and heart beat, and the psychogalvanic reflex at the sound of the metronome, gives way gradually to one that is localized and precise. At the sound of the metronome, the sheep raises his head and ears, assumes a crouching position, and half flexes the leg that carries the electrode; when the shock comes, the animal flexes the leg completely, replaces it on the ground and relaxes.

The animal could be conditioned in a similar manner if the electric shock came at the tenth, fifteenth, or even at the twenty-fifth second. If, however, the interval was thirty seconds, the animal waited too long, then not long enough, before the shock came. After such experiences, the animal's behavior changed in and out of the experimental environment. Henceforth, it was restless on the platform. Even when the metronome did not beat, it kept moving its foreleg. When the metronome did beat, it fixed its foreleg with each beat. But still other changes were noted in the animal. Where it formerly went willingly to the laboratory on collar and chain, it now vigorously resisted going there and had to be placed by force on the table. It became more restless even in the pen both during the day and during the night, and tended to be withdrawn, to crouch in a corner, and to be more submissive in case of attack. Its pulse became rapid and irregular as compared with that of the normal animal. The condition in some of the animals continued for several years. Thus an enduring change was produced in the animal's total behavior combined with a psychosomatic disturbance. (Liddell, Anderson, and Parmenter, 1935.)

Such a "neurotic condition" did not occur if the sheep had to learn a simple maze where, if it could not solve the problem, it could turn its attention to other matters. If the same sheep learns to stand quietly and to restrain itself on the platform, it *has* to come to grips with the problem presented.

The concept of adjustment to the normal conditioning situation here includes also an internal change in the animal which can be described only in human terms. To quote Liddell, "It is our belief that this restraint, first imposed from without, and then imposed by the animal upon itself, is the fundamental condition favoring the development of nervous strain with resulting neurosis." It is almost as if the animal, under normal circumstances, were willing to stay finally in the experimental situation and cooperate because of the friendly support of the experimenter. Once his feeling of safety is sufficiently damaged, almost the whole world becomes threatening.

Individual animals vary in the relative ease with which they develop neuroses and in the type of neurosis manifested. In some dogs, it consists mainly of general excitement and con-

tinuous excessive secretion; in others of falling asleep, manifesting waxy-flexibility (the animal's limbs retained the position passively given), and absence of secretion. Pavlov was inclined to attribute these differences to the glandular balance of the animal. These observations prove that the animal's "constitution" or "make-up" plays an important determining role in the ultimate reaction to internal and situational stress.

GROSS OR CHEMICAL DAMAGE TO BRAIN STRUCTURES

Clinical Observations—The Frontal Lobes of the Brain. Frontal Lobectomy: A forty-year-old successful broker on the New York Stock Exchange developed a tumor of the brain. During the operation, large portions of his frontal lobes (premotor areas) were removed on both sides.

He boasted of his prowess in dancing, fighting, and sex, although his actual performance was poor. Together with that he was inclined to be facetious and euphoric. His memory for recent events was faulty. He was incapable of logically following through a topic in thinking or in conversation if this topic was in any way complicated.

On other occasions he behaved in a childish, angry, and abusive manner. He would refuse to get undressed in the evening and to wash his face in the morning. He would walk into a room where people were playing cards and would say, "You're all a lousy bunch of players. Do you want to start something?"

This patient had been a shy and quiet child, submissive to his dominant father and dependent on his mother. In general, he had been a mild and submissive individual who repressed all hostility and had been compensating for his feelings of inadequacy by a whimsical, humorous, and somewhat boastful manner. The one function that had been good was his occupational activity, which he was unable to resume after his operation. (Brickner, 1936.)

The effects of the frontal lobectomy were the complex resultants of the following processes: (1) impairment of the previously good intellectual function (memory and logic); (2) a decrease in self-criticism and self-restraint, and, as a result of this, a compensatory increase in spurious self-evaluation, in the expression of previously repressed hostility, and in childish, dependent attitudes. The functions that he re-

tained from previous periods were some ideals of achievement, a desire for the respect and praise of others, and some self-criticism.

Frontal Lobotomy. An operation has been carried out on a moderately extensive scale on patients who suffer from very severe psychopathology (mostly depression and obsessive-compulsive states). The operation consists of severing the pathways that connect both frontal lobes with the rest of the brain. The permanent effects of the operation are usually as follows: Inertia and lack of ambition, reduction in consecutive thinking, loss of what is commonly called self-consciousness, indifference to the opinions of others, satisfaction with performance even though this may be of inferior quality and quantity—these may be considered among the primary results. Euphoria, evasion, bluffing, talkativeness, facetiousness, aggressive behavior, teasing, indecent acts, inattention, poor judgment—these might be classed among the secondary results.

What is accomplished by the operation is a separation of the ability of the individual to project himself into the future and the feeling tone that accompanies this. Moreover, it is especially the inner sensations, ideas, recollections, ambitions, and disappointments, the regrets for the past and the fears for the future, that are particularly affected in this way. (Freeman and Watts, 1942.)

In a series of 74 cases, the following symptoms were most commonly produced:

Symptom	Total	Persistent	Temporary
Lack of initiative . . .	73	30	43
Euphoria	60	22	38
Procrastination	56	29	27
Laziness	52	22	30
Facetiousness	49	18	31
Tactlessness	47	43	4
Increased appetite . . .	70	50	20

The Hypothalamus. The hypothalamus is an area at the base of the brain and just above the pituitary body. It has been known for some time that this region of the brain plays an important role in vegetative innervation and in metabolism. Centers have been located which play an important role in regulating the heart rate, the heat production, urinary secretion, circulation, oxygen and sugar metabolism. In more recent years, both clinical and experimental observation indicate that the hypothala-

mus plays an important role in general emotional expression and possibly in emotional experience.

Epidemic Encephalitis (Sleeping Sickness). The most interesting observations in this condition were made on individuals who contracted the illness in childhood. After the acute phase passes, one of the characteristic symptoms is so-called hyperkinetic behavior. The individual is over-active, engaging in a variety of activities many of them destructive. This is often combined, particularly in adolescence, with the use of obscene words, excessive and uninhibited sexual behavior such as masturbation, heterosexual and homosexual activities, exhibitionism. In still severer instances there are mood changes such as hostile, sarcastic irritability, at times with depression. There may also be smearing with feces and attacks on other persons, for example in the form of dangerous biting. If such an individual dies of an intercurrent illness, e.g., pneumonia, abnormal microscopic changes are found in the region of the hypothalamus, indicating a low-grade chronic inflammation. The psychiatric disturbance is often associated with obesity, irregular menstruation, premature sexual development, and altered distribution of the hair.

Also of pertinent interest are psychiatric symptoms observed in patients with brain tumors located in this region. If the damage is in the front part of the hypothalamus, excited states with flight of ideas are at times observed. In lesions in the posterior part, more common observations are lethargy, indifference, depression, with a tendency to assume an immobile posture and not react to the environment, as in catatonia.

It seems likely that such pathology in the region of the hypothalamus affects the individual's physiological drives, his aggressiveness, and his reactivity. The individual reacts to the environment in terms of these altered drives. The self-criticism and guilt is not lacking here either, but the patient is unsuccessful in controlling his altered drives, and the conflict results in a defiant reinforcement of the drives. Many of the children, if placed in an institution, can be reeducated so as to function adequately even after they are returned to their home environment. This again illustrates the significance of the environment and the process of "internalization."

EXPERIMENTS ON HUMAN BEINGS

A curved insulated electrode was inserted through the nostril and embedded in the sphenoid bone (at the base of the brain), constituting the "hypothalamic" lead; "cortical" leads were also taken from the scalp. The "hypothalamic" electrode could be used for electric stimulation with the purpose of observing the effects of, and also for obtaining encephalograms during, emotional stress. Electric stimulation through the nasal electrode caused pupillary dilatation, perspiration, and rise in blood pressure. Sometimes anxiety appeared and persisted with crying and expressions of fear for some minutes. Several patients saw their lives pass before their eyes, as has been described in drowning.

At rest, the hypothalamic waves showed a four per second rhythm, the cortical waves, a ten per second rhythm. Following the electric stimulation through the "hypothalamic" electrode, the electric waves obtained from the hypothalamus, as well as those obtained from the cortex, showed alterations. At times they became synchronous. Similar alterations were observed when strong emotions were evoked in a patient by telling him that masturbation had "irreparably damaged him. The cortical and hypothalamic waves then became irregular and partly synchronous, and giant waves and plateaus with frequent cusps appeared." (Grinkier and Serota, 1938.)

EXPERIMENTAL INVESTIGATION ON ANIMALS

Frontal Lobectomized Animal. The frontal lobectomized chimpanzee is distinguished from the normal animal by his restlessness and distractibility and "by a rather fatuous equanimity of spirit which one encounters in a good-natured drunkard, but never in a normal chimpanzee." (Fulton, 1939.) The intellectual performance, including memory, suffers, as indicated by the animal's performance in the following tests.

In the more complex form of the stick-and-platform test, the animal has to use shorter sticks to gather in longer sticks beyond his reach, finally reaching the banana with the longest stick. In another complicated test, sticks of varying lengths are placed on two platforms. In order to get the banana, the chimpanzee has

to carry the sticks from one platform to the other. The normal chimpanzee is able to do this task successfully; but if the premotor areas in both sides are removed, the animal cannot do this.

The delayed reaction test is as follows: There are two cups in the cage, separated from the animal by the bars and a glass door. Food is placed under one of the cups. After a certain length of time the animal is permitted to reach for the food. In order to choose correctly he has to remember under which cup the food was placed. The normal chimpanzee can do this task correctly after intervals of as long as five minutes. After bilateral frontal lobectomy, the chimpanzee is unable to do it after an interval of five seconds.

This test can be made more complicated by lowering an opaque screen after the food is put under one of the cups. The chimpanzee, of course, cannot see the cups until the screen is raised. At times, even normal animals become emotionally disturbed and fail in this form of the test. Thus an adolescent female, affectionate, cooperative, and eager to work in the problem situations, became greatly upset whenever she made an error in the delayed reaction test. In these circumstances she flew into a temper tantrum, during which she rolled on the floor, beat the grate, defecated and urinated, and showed signs of diffuse sympathetic discharge. She finally refused to go into the problem cage. After the removal of both frontal areas, a profound change occurred in this animal. She ran eagerly into the experimental cage, did not get excited when the opaque screen was lowered, and never showed any emotional disturbance no matter how many times she made a mistake. "It was as if the animal had joined the happiness cult of the elder Micheaux and had placed its burdens on the Lord. Objectively the animal failed in the test even with only the glass door in operation." (Jacobsen, 1935.)

Ablation Experiments and Stimulation of the Hypothalamus. If the brain is removed above the hypothalamus in cats, the animals easily exhibit spasms of ragelike behavior when disturbed. At times even the rubbing of the cat's skin is sufficient to precipitate this behavior. The manifestations are arching of the back, clawing, lashing with the tail, snarling, tongue movement, and violent struggling if held, or the animal dashes itself against available ob-

jects. Together with this there is increased breathing, salivation, widening of the pupils, and piloerection. If the cat is operated on one side and the brain anterior to the hypothalamus is removed, the cat will exhibit ragelike reaction to being stroked on the operated side, and will remain a friendly, purring cat if stroked on the other side. (Bard, 1928.)

Very similar behavior is observed in the cat with electric stimulation of the hypothalamus through implanted bipolar needle electrodes in the unanesthetized, freely moving cat. The animal begins to retract its ears, crouch, growl, raise its back and lash its tail, and to show a crescendo of the following typical sympathetic and motor reactions: hyperpnoea, salivation, mydriasis with widened palpebrae, piloerection, biting and striking movements with claws unsheathed, and, finally, precipitate running as though in blind attempts to escape. (Ransom, 1934; Masserman, 1938.)

It is to be noted that the bilaterally frontal lobectomized chimpanzee is much closer to the bilaterally frontal lobectomized or lobotomized human than the hypothalamic animal is to patients with lesions in the hypothalamic regions. This is not surprising, because there are obvious differences in anatomical disturbance in patients with lesions of the hypothalamus and the animal whose hypothalamus is stimulated or in whom the rest of the brain is removed. Nevertheless, there is some similarity between the aggressive, hostile, hyperkinetic post-encephalitic patient and the rage reaction of the animal. Some investigators emphasize that the hypothalamus is not a center of emotional "experience," but one of the important effector relay stations of emotional expression. (Masserman, 1941.)

THE AUTONOMIC NERVOUS SYSTEM

The function of any organ in the body may be of significance for psychosomatics in the broadest sense. In the customary more limited sense, however—normal or pathological changes in bodily function occurring during passing or sustained emotional reaction—the function of the autonomic nervous system is of the most universal significance. It is called "autonomic" because it is not under voluntary control, it has "autonomy." It is motor in its function (it carries centrifugal impulses) and has two main divisions: the "sympathetic" and "parasympa-

thetic." Roughly these two divisions differ in their (1) anatomy, (2) function, (3) reaction to drugs, and (4) chemistry of activity.

Anatomically the "sympathetic" part is also called "thoraco-lumbar outflow" because the fibers leave the spinal cord in the thoracic and lumbar sections. The "parasympathetic" is called "craniosacral outflow" because its fibers leave the central nervous system with the cranial nerves or from the sacral section of the spinal cord. Functionally the two systems are largely antagonistic. Stimulation of the sympathetic causes: dilation of the pupil; protrusion of the eyeball; secretion of sweat; erection of hair; vasoconstriction of most arteries; acceleration of the heart; dilatation of the bronchi; inhibition of intestinal peristalsis with closure of the pyloric sphincters. Stimulation of the parasympathetic causes: slowing of the heart; constriction of the bronchi; contraction of the stomach and intestine with relaxation of their sphincters; secretion in the stomach and pancreas; constriction of the pupils; and in general vasodilatation of most arteries.

As regards reaction to drugs in general, and chemistry of activity adrenin stimulates the sympathetic, ergatamine tartarate inhibits it; atropin inhibits the parasympathetic, pilocarpin stimulates it. The activity of the sympathetic is mediated from the nerve ending to the executive apparatus by the production of adrenin—that of parasympathetic by the production of acetylcholin.

The anatomical differentiation between the two systems, however, does not entirely parallel the chemical differentiation. Thus the sweat glands are supplied by the sympathetic (lumbosacral outflow), yet they are cholinergic in their response.

Both systems have a peripheral cell system, a next higher representation in the spinal cord or brainstem, next higher in the diencephalon (hypothalamus), and, as recent investigations have shown, in the frontal lobes.

The sympathetic system has a greater tendency toward diffuse, the parasympathetic toward circumscribed, reaction. Normal function requires a balance between the two systems. Although signs of over-reactivity of one of the systems usually predominate, in most patients symptoms arising from both systems are present.

Experimental investigations indicate that in

acute emotional reactions, there is a rise in the blood of both cholinergic and adrenergic substances. The rise of the adrenergic substance was proved by Cannon (1915). The rise in the cholinergic substance was shown recently by two experiments. The nerve impulse to the skeletal muscles is mediated by acetylcholin. The facial nerves of monkeys were severed. During the period when the neuromyal (nerve-muscle) junction became over-sensitive to stimulation, the monkey's face twitched whenever he was frightened. This proved the presence of an excess amount of cholinergic substance in the blood during excitement. (Bender, 1938.) Also, the excised intestinal loop of the rabbit continues its tone and rhythmic contractions if placed in Ringer solution. If the blood of anxious depressed patients was added to the solution, the tone increased (cholinergic effect), but the contractions became irregular and of lesser amplitude (adrenergic effect). (Milhorat, Small, Doty, and Bartels, 1943.)

THE THYROID HORMONE AND PSYCHOLOGICAL FUNCTIONS

Adult Myxedema. In this condition the adult person exhibits the following symptoms: His skin becomes dry, sweating is diminished, there is a swelling of the skin that does not retain the mark of the finger-pressure, and the pulse is slow (ca. fifty per minute). Together with this, there is a considerable slowing down of reactions and decline in the intelligence. All these manifestations are accompanied by a striking drop in the basal metabolism of the body (—30 to —40 per cent). If such an individual is given adequate amounts of thyroid substance, all the described symptoms disappear, and he regains his previous normal intelligence and reactivity. If most of the thyroid gland is removed in an operation on the adult, identical symptoms arise as in myxedema. (Kocher, 1883.) They are likewise corrected by the administration of thyroid.

Cretinism. In this condition the individual is born with an insufficiently functioning thyroid gland. If the individual is not treated, he exhibits a stunted and disproportionate growth, a large tongue, and all the other symptoms described under adult myxedema but in greater severity. The intelligence is that of either the idiot or the imbecile, and the individual is unable to acquire relatively elementary social hab-

its of cleanliness and adequate regulation of excretory functions. If the condition is recognized early in infancy and the individual receives adequate amounts of thyroid throughout life, the majority of such patients develop normally. If the treatment is started too late, or if the condition was of long duration *in utero*, thyroid substance will not be effective in repairing damage to previous development.

Excessive Thyroid Function. If normal individuals take large enough amounts of thyroid substance, the following phenomena can be observed: There is an increase in pulse rate, excessive perspiration, trembling of the hands, general restlessness with inability to relax, increased irritability, emotional instability in the sense of temper outbursts, easier crying and laughing, and over-talkativeness. This is accompanied by a rise in the basal metabolism (ca. 25 to 50 per cent). The severity of these symptoms, including loss of weight, partly depends on the amount of thyroid taken. If the thyroid intake is discontinued, the symptoms disappear.

The observations mentioned illustrate the fact that metabolic changes in the nervous system, namely increased or decreased oxidation correlated with various levels of thyroid hormone, result in alterations of intellect and emotional reactivity.

The changes described, as previously mentioned, are primary correlates of the altered physiochemical function. The complexity of reactions, however, is evidenced by the following additional observations: The adult patient suffering from myxedema often has strong feelings of inadequacy. He realizes the drop in the level of his performance and his inability to live up to his individual and social ideals. This is not a direct effect of the lack of thyroid substance. As a further reaction in relatively milder deficiencies, the patient may manifest increased irritability, representing a defensive hostile reaction to the feeling of inadequacy; or emotional depression may dominate the picture if the individual evaluates the deficiencies of function as a sign of worthlessness, irreplaceable lack, and deformity.

Patients with excessive thyroid substance are apt to feel guilty and self-condemnatory because of the aggressive, irritable, hostile outbursts and feel ashamed because of crying. They are also apt to feel anxious because of their inability to control their reactions.

EFFECTS OF LOW OXYGEN ATMOSPHERES

Seventeen medical students who breathed an atmosphere of 13 per cent oxygen (corresponding to an altitude of 12,400 feet) for three hours revealed marked changes in affective behavior, with impairment of emotional control; in 59 per cent elation and flightiness, terminating in lethargy, and in 41 per cent mental dullness from the beginning.

Psychoneurotic patients after inhalation of the low oxygen mixture revealed an even more marked lack of emotional restraint, with feelings of exaggerated self-esteem and sexual pre-occupations. Their mood ultimately changed from that resembling a hypomanic state to dullness and lethargy. Those patients (four of nine) who did not show elation at the start were dull and lethargic from the beginning. (McFarland, Barach, and Kagan, 1940.)

Forty college students with careful personality studies, including Rorschach test, were exposed to 9.3 per cent oxygen (corresponding to an altitude of 18,500 feet) for about one hour. The following statistically significant relationship was found between tolerance for low oxygen and personality types without overt psychoneurosis: Individuals who are rigid, anxious, not very dependent on themselves and inhibited in their responses react poorly to the high altitude situation. Individuals who are outgoing but do not have sufficient inner balance also experience difficulties, although not to the same degree as the highly inhibited group. Individuals well integrated with respect to the use of their inner resources and responsive to external stimulation react best of all. (Hertzman, Or-lansky, and Seitz, 1944.)

Résumé and Comment. On the basis of the observations on patients with bilateral frontal lobectomy, patients with pathology in the hypothalamic region, and operated animals, it can be concluded that these parts of the brain play a significant role in the intellectual, physiological, and emotional experiences of the individual. Further, it can be said that, in case of damage in these regions, and similarly in metabolic disturbances of the brain cells, the ensuing psychopathology is a complex resultant of primary alterations in the functions of the individual and the reactions of the total personality to these alterations. The reactivity changes with the environmental setting.

These observations do not elucidate the nature of the physiological functional pattern in individuals with psychogenic disturbances. They merely state that in case of removal of, or visible damage to certain brain structures, certain types of personality disturbances arise. Similarly, the discovery that the nerve cells in the central gyrus are indispensable for adequate movement and control of the skeletal musculature does not describe the neuro-chemical patterns that occur in voluntary movement, and even less do they describe the variations in these patterns and their interrelations with other patterns if the movements are purposeful, if they have a background of fear or resentment or sympathy.

SPECIAL SYNDROMES

In the preceding, general psychosomatic methods, concepts, and principles had been presented. In the following, psychosomatic syndromes will be discussed which frequently dominate the picture in individual patients. The following general remarks apply to the special syndromes:

(1) Patients usually present a variety of psychosomatic disturbances in which one symptom or syndrome predominates. At other times, there are several that predominate. The patient may have both asthma and peptic ulcers. Thus a discussion of various syndromes is done on the basis of a special focus.

(2) In explanations why an individual has a special kind of psychosomatic disturbance, the following observations and assumptions have become prevalent: (a) The individual's bodily tendencies, both constitution or incidental illness, determine the predominant syndrome in reactions to life situations. There is evidence for this assumption. Some psychosomatic disturbances, like allergy (asthma, hives, dermatitis) or hypertension, show a familial incidence, and allergic symptoms may start in early infancy. Nevertheless, psychotherapy in adulthood may relieve the patient of his symptoms. A gastrointestinal upset may first occur as a result of dietary indiscretion but may continue as a result of, or may recur regularly during periods of stress.

(b) Characteristic personality and conflicts determine the occurrence of special psychosomatic syndromes. There is evidence for this assumption also. Patients with arterial hyper-

tension commonly are well controlled, persistent individuals with repressed conflict over aggression directed towards persons in authority, together with guilt and fear of abandonment.

Nevertheless, one often finds patients with constitutional types, personalities, and focal conflicts different from those commonly encountered in the psychosomatic ailment in question. Further, it may depend on the special focus of the investigator which aspects of the total complexity of attitudes and reactions of the patient he singles out for the psychosomatic correlation. These problems will be illustrated on alterations in finger temperature as observed in a patient in the course of psychoanalytic treatment. (Mittelman and Wolff, 1943.)

In the course of the observations, she developed, in response to a disappointing remark of her husband, a depressive (psychoneurotic) reaction, which reached its peak on the fourth day and lasted one week in all. The patient's reactions during this period of observation included feelings of rejection, first by her husband, then by the analyst, of being deprived and humiliated. Out of these feelings arose resentment, very soon repressed because of feelings of guilt, fear of complete abandonment, and frustration. The resentment included the unconscious desire to inflict genital injury, and the feeling of being abandoned included memories of parental rejection and sibling rivalry. The depression was resolved in the fifth interview through a feeling of being forgiven by the analyst and by her husband for her resentment and, as a token of that, of being accepted completely, taken care of, and sexually gratified. In four analytic interviews, the finger temperature fell concomitantly with depression, resentment, and particularly anxiety. In the fifth, the finger temperature rose concomitantly with the consciously experienced sexual excitement.

These observations illustrate the complexity of findings even in a single individual. Cold extremities were one of this patient's complaints. Her main complaint was depression, but along with it she had the complaints of fatigue, frequency of urination, and headaches. The dominant psychological pattern in correlation with fall of the finger temperature appeared to be anxiety superimposed on depression and conflicts about aggressive and sexual use of the extremities; relaxation, feeling of security, being forgiven, and sexual excitement in correla-

tion with rise in finger temperature. This patient's personality was characterized by superior intellect, persistent goals and ideals, desire for emotional closeness, and strong control over emotions. But cold extremities can also be found in shy, self-effacing individuals without strong ideals and without strong control of emotions, as well as in aggressive but anxious persons. Their emotional reaction patterns may differ in relative accent on guilt, anxiety, aggression, sexual conflict, dependency needs, and fear of abandonment—reactions observed in nearly all patients with psychopathology. We may thus conclude that in specific syndromes, characteristic personality types and emotional reaction patterns are found to predominate without exclusive uniformity.

The patient's symptoms and the results of psychosomatic experiments concern the same phenomena in conditions like cold extremities. In other conditions there is still a gap between the two types of data. Asthmatic attacks and the experimental results, i.e., alterations in the respiratory curves during stress, represent related but not identical phenomena.

In the following, these predominant personality types and conflict constellations will be presented together with the experimental evidence available for the demonstration of psychosomatic correlations.

Reactions in Which Attacks of Fear and Those in Which Obsessive Thoughts and Compulsive Acts or Fatigue Predominate. The physiological accompaniments of "anxiety attacks" have been discussed earlier (difficulty in breathing, palpitation, diarrhea, trembling, "lump in the throat" etc.). "Compulsive-obsessive states" are often accompanied by less striking physiological disturbances, e.g., cold and clammy extremities, constipation, and tremor of the hand. In "neurasthenia" the main complaints are fatigue and often, constipation. (See also "Hypoglycemia.")

Reactions in Which Impairment of Function Without Gross Structural Pathology Predominates. (Conversion Hysteria). There are several syndromes that fall under this heading. They are all characterized by severe impairment of function without gross organic pathology. The symptoms may be blindness, deafness, paralysis or spasm of one of the extremities, pain in the back, inability to stand or walk (astasia-abasia), loss of voice so that the subject is able to speak

only in a whisper, or anesthesia or analgesia (loss of sensation of touch and pain) in some parts of the body. There are two personality types that are encountered with this type of illness: One is emotionally labile with mood swings and easy crying; the other is serene, showing no alarm about the symptom. Charcot (1890) referred to this as *belle indifférence* (beautiful indifference). Psychodynamically, each of these symptoms represents an attempt at solving a conflict by eliminating a function, or preventing it as in spasm, in order to escape danger. The organ particularly affected usually has a symbolic meaning. Thus the paralysis of the hand is a way of preventing carrying out a murder which the patient unconsciously desires or a sexual act which is forbidden. In the latter instance, the organ affected unconsciously may represent the sexual organ. Treatment is psychotherapy.

Experimental Investigations. It has been mentioned previously that (1) the symptoms can be made to appear and disappear by hypnotic command. (2) The electroencephalogram changes with hypnotic appearance and disappearance of suggested blindness.

Reactions in Which General or Localized Disturbances of Muscle Tone and Status Predominate. Increase in muscle tension, tremor (trembling), and waxy-flexibility occur as concomitant symptoms with more serious psychological manifestations. Generalized rigidity of the muscles similar to the one observed in illnesses affecting the basal ganglia of the brain (extrapyramidal system), and sudden relaxation of the musculature of the body leading to an extreme weakness and collapse, however, can be dominant symptoms. As far as is known psychodynamically, tremor is a concomitant of anxiety, increased muscular tension is an unconscious attempt to cope with problems, severe rigidity of the muscles (similar to extrapyramidal rigidity), as observed in battle reactions, is a defense against terror. (Grinker and Spiegel, 1945.) Waxy-flexibility is an expression of indifference to reality and of obedience. Extreme weakness is the expression of "giving up" as an attempt to solve unbearable conflicts. When these conditions are psychogenic, the treatment is psychotherapy.

Experimental Investigations. Muscular tension, waxy-flexibility can be induced and made to disappear in hypnosis.

In another experimental set-up, the subject is asked to hold a rubber bulb in each of his hands, but respond to signals only with his right hand. If the subject is confronted with conflict situations or is put under stress, tremors, or the pressure of the left hand can be recorded graphically even when responses of the right are successfully inhibited. (Luria, 1929.)

Tics

Tics are recurrent spasmodic movements of an extremity, of the head, the respiratory muscles, or the muscles of the eyelids, often closely resembling purposeful movements. They are at times due to lesions in the striate bodies of the brain, other times they are mainly psychogenic. In the latter case, they represent either defensive movement against unconscious dangers or are the expression of hostile and sexual impulses (e.g., a respiratory tic may contain a slurred obscene word).

Experimental Investigations. Chicks raised in incubators (on wire mesh) where there is no opportunity to peck from the ground—thus have an unsatisfied need for pecking—often exhibit a tic that resembles pecking. (Levy, 1938.)

STAMMERING

Stammering is a speech disorder characterized by a spasmodic repetition or blocking on some sounds, usually consonants, when these start words. Anybody may exhibit a slight transient stammer during stress. The severity of disorder in real stammerers also varies with stress situations, both passing and over long periods of time.

The importance of stress is most dramatically illustrated in children who develop stammering, e.g., after a tonsillectomy, particularly at a time they are preoccupied with the newly discovered difference between the sexes. A sympathetic discussion, information, and reassurance may permanently eliminate the disorder.

Dynamic speech may imply self-assertion, hostile attack, and exposure. Low self-esteem, guilt, fear of punishment in the form of injury results in a spastic attempt to stop articulation. This further leads to over-compensatory haste to articulate and in this manner to an intensification of the spasm.

An important factor in stammering may be

uncertainty of cerebral dominance. (Orton, 1937.) Seventy-five per cent of the population is born with a tendency toward right-handedness which means that the speech center is in the left hemisphere and it is assumed then that impulses from the left hemisphere dominate the right. The other 25 per cent of the population is born either with a tendency to left-handedness or without any definite predilection ("ambidextrous"). In the latter group there may remain an uncertainty of cerebral dominance. If the left-handed child is trained to be right-handed, the same may occur—together with the arousal of many additional conflicts. In uncertain cerebral dominance the speech difficulty may be associated with reading difficulty, particularly "reversals," i.e., reading "saw" for "was."

Electroencephalography has been used to shed light on this problem. In normal individuals the α waves obtained from the two hemispheres are usually smooth and synchronous. In the stammerers, they are frequently out of phase with each other and often obliterated, especially when blocking occurs in speech. (Lindsley, 1940.)

The most generally effective treatment is speech training in a group, comprising frequent sessions. Such a procedure has many psychotherapeutic implications. The feeling of uniqueness, isolation, and inadequacy is lessened. Feelings of belongingness and companionship develop through new friendships. There is mutual encouragement through success. A general survey of the patient's situation and problems should always be made. Psychoanalysis is successful at times.

REACTIONS IN WHICH HEADACHE PREDOMINATES

Complaints of headache are common in personality disturbances.

Migraine. Migraine consists of periodic severe headaches, usually on one side, frequently accompanied by nausea, vomiting, constipation, or diarrhea. In more severe cases, the patient may have spots before the eyes, hemionopsia (not seeing objects on one side with either eye), paresthesia (sensation of pins and needles), hypoesthesia (diminished sensitivity), and weakness on one side of the body. The attack may last from a few hours to several days.

Migraine usually occurs as a reaction to situations of stress. As a rule, patients suffering

from these attacks are unusually ambitious and preoccupied with achievement and success. They are often perfectionists, to whom efficiency means a great deal; they are orderly to an extreme. A disturbance of the sexual function is common, manifesting itself in frigidity and disgust. (Knopf, 1935; Wolff, 1937.) Severe conflict over masturbation in late adolescence is not uncommon. There is also conflict over hostile reactions towards persons who interfere with the subject's perfectionistic strivings. The condition often occurs in several members of the same family.

The medicinal treatment, if it is a relatively mild headache, is coal tar products (like "aspirin"). Severe attacks can be stopped by the injection of ergotamine tartrate.

Experimental Investigations. A variety of experiments show that the headache in migraine results from distension of the cranial arteries. (Wolff, 1940.) Photographs made both before and during the action of ergotamine tartrate show that this agent reduces the amplitude of pulsations of the cranial arteries by about 50 per cent and thereby diminishes the intensity of, or terminates the headache. It has not been possible thus far to precipitate migraine attack through discussion of life situation.

REACTIONS IN WHICH DISTURBANCES OF THE CIRCULATORY SYSTEM PREDOMINATE

Peripheral Circulation; Raynaud's Syndrome. This syndrome is characterized by attacks, in one or more of the fingers, of pain, cyanosis (deep blue discoloration), or blanching, precipitated either through exposure to cold or emotional stress. If the condition is severe enough, small ulcers develop on the skin of the finger, the nail gets brittle, and, in very severe forms of the disease, part of the finger may be lost because of gangrene. The common focal conflict is guilt and fear of injury and abandonment, over-aggressive and sexual strivings, particularly as expressed through the use of the hands. The patient is either shy, self-effacing, and anxious, or self-controlled, idealistic, and persistent. The physical predisposition is obscure. This condition, and cold extremities in general, occurs more frequently in women either because the special type of conflict is more keen or because of metabolic differences. Psychotherapy has not been tried on an intensive enough scale to know how permanently effective

it is. The physical treatment consists of protection of the hand against cold and, in severer cases, operative removal of sympathetic nerve supply to the extremity involved.

Experimental Investigations. The occurrence of vasoconstriction in the extremities during emotional stress has been studied by (1) the use of the plethysmograph, (2) measurement of the finger temperature, (3) colorimeter, and (4) capillary microscope. The use of the plethysmograph has been described in the general section of this article.

Capillary Microscope. The blood flow in the capillary bed under the nails can be observed directly with the microscope. In some accidental observations, it has been seen that the flow of blood in patients suffering from Raynaud's syndrome suddenly stopped when a new individual entered the room who upset the patient. (Fremont-Smith, 1939.)

Colorimeter. The color of the fingers varies from pink to blue, depending on the blood flow in the skin. The color change can be measured accurately with the colorimeter. It can be observed that during induced stress the color changes to bluish.

Finger Temperature. The most sensitive instrument is the radiometer which measures the amount of heat radiation from the part of the extremities studied. (Hardy, 1939.) This instrument was used in a detailed investigation of finger temperature changes in individuals without significant psychopathology and those with psychoneuroses and on two patients with Raynaud's syndrome. The stress situation was mainly the discussion with the subject of emotionally charged life situations either current or past. The discussion was often sustained for an hour. In 203 observations on 47 subjects, in experiments conducted with this method, there was a fall in finger temperature during emotional stress in all but three instances. In two subjects a slight rise in finger temperature occurred. The relative magnitude of the fall in finger temperature varied with the subjects even under comparable emotional stress as gauged by subjective statement, restlessness, facial expression, voice, topic of conversation. In some subjects the finger temperature regularly can be made to fall ca. twelve degrees centigrade, in others only two or four degrees. To some extent the readiness for the finger temperature to drop during emotional stress

was correlated with the individual's sensitivity to heat loss. If the individual needed more clothing in the same environmental temperature than other individuals, then the fall in finger temperature was apt to be great during emotional stress even if the clothing was otherwise adequate to enable the individual to maintain high finger temperature in a relaxed state for several hours. In the experiments on a patient suffering from Raynaud's syndrome, attacks could be precipitated (1) if the subject's clothing was inadequate so that the temperature of the fingers fell to a certain level; (2) in a cool environment even with adequate clothing if the life situation stresses were discussed with the subject for a half hour. The severest attacks were precipitated if inadequate clothing in a cool environment was combined with the discussion of life stresses. After sympathectomy, the fall in finger temperature during emotional stress disappeared and no attack occurred.

Résumé. There is experimental evidence to show that vaso-constriction commonly occurs in the extremities during emotional stress. The degree of vasoconstriction during comparable emotional stress varies from individual to individual. The environmental temperature and the effects of emotional stress combine in producing the degree of vasoconstriction. In Raynaud's syndrome, attacks can be precipitated in a cool environment by inducing emotional stress. The impulse to the blood vessels is mediated through the sympathetic nervous system.

ARTERIAL HYPERTENSION

Arterial hypertension is characterized by increase in the blood pressure without, in the early stages, structural damage being demonstrable in the blood vessels. The normal limits of the blood pressure are debatable, but a consistently elevated systolic pressure over 150 and consistently elevated diastolic over 70 is definite elevation.

Of 93 patients with hypertension 86 showed significant emotional factors in the production of symptoms. (Weiss, 1942.) The focal conflict in hypertension commonly revolves around constellations of hostility and dependency. (Hill, 1935; Menninger, 1938; Saul and Alexander, 1939; Binger, Ackerman, and Cohen, 1945.) This aggression may come from a variety of sources, such as frustrated dependency needs, hurt self-esteem, threat to a dominating posi-

tion, rebellion against authority, and sexual injury. The personality is apt to be one of two types:

(a) An active individual who aggressively participates in group activities. In this type, hostility is connected with hurt self-esteem and threat to position and achievement. The aggression may be overt and excessive.

(b) An outwardly calm and obliging individual, not without initiative but obedient to rules.

The somatic predisposition to hypertension is obscure. In some cases a constitutional tendency is likely: in some families several members in several generations suffer from this disease and die finally of cerebral hemorrhage or heart attack. This illustrates also that hypertension, if it continues long enough, is apt to lead ultimately to structural changes in the vascular system. Psychotherapy, particularly psychoanalysis, can be very effective in bringing the blood pressure to a lower level when the patient's conflicts are resolved. (Hill, 1935; Mittelman, 1945.) In severe cases, an operation can be performed which consists of severing the sympathetic nerve supply to the blood vessels. (Thoracolumbar Sympathectomy.)

Experimental Investigations. Blood pressure is measured in human beings by the sphygmomanometer. A cuff, connected with a manometer recording the pressure, is put around the arm and is inflated with air to a point where the rhythmic sounds over the artery disappear because of the cessation of the blood flow. Sound is present only when the artery is partly compressed. As the air is gradually let out of the cuff, the appearance of the first sound over the artery signals the reestablishment of the circulation, that is the systolic pressure (systolic indicating contraction of the heart, maximum pressure). As the pressure is gradually lowered, the sound disappears, indicating the diastolic pressure.

Fleeting rise in blood pressure was observed in response to startle and lying. (Marston, 1917.) Sustained rise in the blood pressure occurred in 13 students examined before and after an important six-hour examination. It was very high, 165 mm. on the average, beforehand, 152 mm., still high, afterwards. In some students it was high for several days. (Tigerstadt, 1926.) Some "normal" subjects as well as patients with cardiovascular disorders may

show normal pressure, during periods of life stress, if they are at rest; but the rise in pressure is found to be excessive during such periods in response to a standard physical exercise. (Wolf and Wolff, 1946.) The rise in pressure is caused mainly by vasoconstriction. By a preliminary operation a bit of the lining of a dog's intestine was grafted into the skin while still retaining its own proper nerves and blood vessels. Thus a sample of the intestinal mucous membrane was exposed to view. Whenever this dog was frightened, as by the approach of a strange person, the membrane blanched. (Barcroft, Florey, and Drury, 1929.)

The significance of anxiety is further illustrated by accidental observation on kidney function on two subjects who got into acute states of anxiety while the circulation of the kidneys was being measured. The renal blood flow was decreased by about 40 per cent and there was an increase in blood pressure. It may be mentioned that a diminished blood flow in the kidneys liberates a substance which raises the level of the blood pressure. (Smith, Goldring and Chasis, 1938.) In a patient who was under psychoanalytic treatment for hypertension, the blood pressure was measured regularly before and after the analytic interview. Whenever the patient's emotional tension, particularly hostility and anxiety, was reduced as a result of the analytic interview, the systolic blood pressure averaged 10-20 points lower after the interview. (Alexander, 1939.)

Résumé. Experimental evidence shows that blood pressure can rise in fear and resentment, and the circulation in the kidneys may be abruptly diminished in fear. In patients suffering from hypertension, the blood pressure may be lowered when the conflict situation is resolved.

DISORDERS OF THE HEART FUNCTION

The heart action may show a variety of disorders in connection with personality problems: rapid or irregular heart rate, pain in the heart region. These disorders commonly represent one symptom of a psychoneurotic reaction pattern. One of these, namely neurocirculatory asthenia, is a fairly well defined syndrome.

Neurocirculatory Asthenia. The syndrome is characterized by rapid and labile action of the heart (over eighty beats per minute), difficulty

in breathing, often with feelings of faintness and dizziness, and cold extremities. The syndrome has also been called disordered action of the heart, soldier's heart, and effort syndrome. The syndrome was first observed during the American Civil War in soldiers (Da Costa, 1871), then during the First World War. (Lewis, 1918.) The condition is essentially an anxiety state, particularly aggravated by exercise. The patient is afraid of physical effort, constantly anticipates it, and, in this sense, is constantly engaged in it. The syndrome offers a particularly striking example of the combined effect of anxiety and of physical effort. Physical effort comes to represent aggressive and sexual behavior with the attendant anxiety, and in soldiers, of course, there is unconscious rebellion against discipline and fear of injury and loss of life.

In experimental investigations, it can actually be observed that the patient's pulse rate rises very rapidly during moderate effort. The respiratory tracing, even at rest, shows irregularity of level and of depth of breathing. (Christie, 1935.) Patients with such a condition are not capable of sustained physical effort. Treatment is psychotherapy.

Coronary Disease of the Heart. The coronary artery is the blood vessel that supplies the heart muscle with blood. Either a spasm or partial occlusion of the coronary artery or its branches leads to severe attacks of pain in the heart region.

The personality of individuals with coronary disease is apt to be perfectionistic, driving, with a steady devotion to goals. Impulsive changes in life situations are infrequent. The conflict constellation connected with coronary disease itself is apt to be either resentment over failure, and thus over not living up to ideals, and over humiliation; or that of resentment over rejection with fear of abandonment and guilt over hostile and sexual strivings.

Coronary disease of the heart is not infrequently found in families that are predisposed to vascular diseases. Physical treatment consists of prolonged bedrest with oxygen administration and injection of morphine to relieve pain after an occlusion, and administration of vasodilators (e.g., amylnitrite) to relieve the spasm. Psychotherapy can be very effective in diminishing the frequency and severity of attacks,

and the patient may be able to engage in a moderate amount of physical effort when previously even a small effort brought about pain.

Congestive Heart Failure. Heart failure may result from coronary disease, from hypertension, or from rheumatic heart disease. The failure results from the excess load placed on the heart or through direct weakening of the muscle. Emotional stress may intensify the failure by directly affecting the blood pressure and the coronary artery or through nervous and humoral influence on the heart function. The physical treatment of heart failure is rest in bed and the administration of digitalis and diuretics. At times recovery is much helped by psychotherapy.

Experimental Investigations. It has been mentioned that the heart rate usually increases during fear, anger, lying, and sexual excitement, particularly orgasm. The cardi tachometer gives a continuous record of the heart rate. The electrocardiograph is led through electrodes and flexible leads—which can be as long as 100 feet, permitting the subject to work or play freely while his heart rate is being recorded—to a graphic registering device. During sexual behavior of a married couple, the heart rate rose, over some seconds, to 146 beats per minute in orgasm. (Boas and Goldschmidt, 1932.)

The electrocardiogram is a record of the electric waves produced by the heart muscle in the course of its contraction and relaxation. It has been found that the electrocardiogram may show pathological changes during intense emotional reactions (anxiety, tension, resentment, and sexual excitement), and these pathological changes disappear when the emotional disturbance is relieved. In a study of 41 patients who suffered from personality disorders with intense emotional reactions, two showed such abnormal findings. (Loftus, Gold, and Diethelm, 1945.)

Résumé. There is experimental evidence to demonstrate that the heart rate may increase during anger, fear, anxiety, and sexual excitement. Pathological changes in the electrocardiogram may occur correlated with intense fear, anger, and sexual excitement. In patients with heart failure and with coronary disease, symptoms may diminish considerably when the conflicts are resolved.

REACTIONS IN WHICH DISORDERS OF THE RESPIRATORY SYSTEM PREDOMINATE

Vasomotor Rhinitis,¹ Common Cold, Sinus Disease. Vasomotor rhinitis consists of congestion of the nasal mucous membrane and of the conjunctivae of the eyes and a thin, watery secretion from the nose together with sneezing and with itching of the eyes. The personality types may vary. The common stress situation is that of frustrated dependency longing, directed particularly towards the mother or mother substitute. There may also be strong sexual curiosity relating to the function of reproduction and desire to look and smell. The result of the conflict may be congestion of the nasal mucous membrane with damage of both olfactory and visual perception. (Wilson, 1941; Saul, 1941.)

At times frequent colds and sinusitis develop on a similar emotional background because the circulatory disturbance leads to lowered resistance to infection.

Experimental Investigations. Daily observations of nasal functions and structures, including changes in circulation, swelling, secretion, evidences of obstruction, and pain, were made on groups of healthy and sick persons. Daily records were made of the subject's life situation, attitudes, dominant emotional reactions, fantasies, and dreams. It was found that abject fear and dejection and disgust were associated with pallor of the nasal mucosa and decreased secretion; on the other hand, anxiety and

¹ The asthmatic syndrome, urticaria, and vasomotor rhinitis are not always or completely emotionally determined, although there often are strong emotional factors in the total picture. Frequently the condition is caused mainly or entirely by the individual sensitiveness to an external protein in the form of food or something which the patient inhales (allergen). The offending agents may be horsehair or some other animal hair, pollens, beef, pork, etc. The attack occurs whenever the patient is exposed to the offending agent, and it disappears if this substance is eliminated. In some instances the patient is sensitive to an agent, but attacks occur only during periods of emotional stress. In the allergic physiochemical reaction, a histamine-like substance is liberated in the body. This substance stimulates certain nerve endings, or the capillaries are affected directly, and the various symptoms are produced. This histamine-like substance is produced even in conditions in which the psychogenic factor eventually is the most important determinant. Allergic reactions often show familial incidence.

resentment were associated with redness and swelling of the mucosa, increased secretion, and obstruction. Weeping, as well as the feeling of being on the verge of tears, were associated with pallor, extreme swelling of the nasal mucosa, profuse secretion, and obstruction with complaints of difficulty in breathing. (Goodell and Wolff, 1946.)

BRONCHIAL ASTHMA

Bronchial asthma is characterized by attacks of difficulty in breathing, wheezing sounds over the chest, and increase in eosinophilic cells in the blood. The attacks are caused by an involuntary contraction of the bronchial muscles. This spasm interferes with the respiration during both inspiration and expiration, but particularly during expiration. This contraction of the bronchial muscles is mediated chiefly through the vagus nerve.

The asthmatic attack is correlated mainly with attitudes of anger and hostility, particularly towards a dependency figure (mother or her substitute) and the resultant fear of abandonment. (French, 1939.) In 37 of 50 unselected asthma patients emotional factors were significant in the maintenance of the illness. (McDermott and Cobb, 1939.) The multiple psychogenic factors are: (1) physical illness in childhood (either onset of asthma for allergic reasons in childhood or whooping cough or bronchitis) during a period of emotional conflict, e.g., attachment and hostility towards the parents; (2) parental attitude towards the child during this period, concentrated on the child's illness (the mother particularly); (3) current conflict in adulthood (e.g., wife separated from her husband). (Deutsch, 1939.)

The common personality type in asthma is either the smiling, unruffled, or the openly dependent, emotionally unstable individual. Their fantasy life is apt to be very lively with a fantasy occasionally carried into action. (Dunbar, 1943.)

In the asthmatic attack, the administration of adrenalin, ephedrin, or atropin is as a rule immediately effective, because the bronchial muscles are relaxed. The first two of these drugs accomplish this by stimulating the sympathetic and the atropin does this by paralyzing the vagus nerve. If the substance to which the patient is allergic can be determined either by skin tests or by elimination diet, then the elim-

ination of the substance may stop the asthma. Psychotherapy is often very effective even in patients who have suffered from asthma for twenty years.

Experimental Investigations. The respiratory curve and the amount of oxygen consumption (basal metabolic rate) of several patients was determined, first in a period of relaxation, then while they thought of disturbing events. During disturbed periods, respiration became more frequent and deeper, the inspiration-expiration angle grew sharper, and the oxygen consumption rose considerably. (Finesinger, 1939.)

Respiration can be recorded by three methods: (1) recording the changes of the chest girth with the respiratory movements by means of an elastic belt strapped around the chest; (2) breath current recorder, by means of a gas mask with valves—during expiration the connected tambour rises, during inspiration it falls; (3) body plethysmograph: The subject is seated inside an airtight box. The connected tambour rises during inspiration and falls during expiration. In experiments with uniform methods and stimuli, it has been found that the breathing in excitement is both fast and deep. The ratio between the duration of inspiration and expiration (Storing, 1906), in ordinary quiet breathing, averages about 0.4 to 0.45, somewhat less than half. This ratio tends to be high in excitement. It increases after lying. (Benussi, 1914.)

There is suggestive evidence that the shape of the respiratory curve at rest is correlated with some personality tendencies. Inspiratory spikes, rounded tips at inspiration, and breath-holding at inspiration seem connected with psychological intaking tendencies; shallow respiration, rounding of expiratory tips, and breath-holding at expiration, with psychological eliminating tendencies. (Alexander and Saul, 1940.)

Résumé. Experimental investigations demonstrate that the rate and curve of respiration may be altered during emotional stress. Asthmatic attacks may lessen in severity and frequency or may disappear entirely when the patient's conflicts are resolved.

PULMONARY TUBERCULOSIS

The tubercle bacillus may cause chronic inflammation in any organ of the body. The most common site is represented by the lungs. Reac-

tions to life situations may act as factors lowering the resistance of the individual to this infection. (Jelliffe and Evans, 1919.) Reactivation of the inflammatory process just at the time of the planned discharge from the sanatorium is not an uncommon observation. The fear and reluctance to leave a sheltered environment may be a factor in it. At times the onset and recurrence of the illness seems correlated with a largely unconscious defiant, self-destructive refusal of the patient to commit himself to a course required by an actual and internalized authority (usually father figure).

Psychotherapy may be a useful adjunct in the treatment, which is mainly adequate food, rest, and general hygiene.

REACTIONS IN WHICH DISORDERS OF THE SKIN PREDOMINATE

The skin disorders that are connected with personality problems are excessive perspiration of the armpit and of the extremities with thickening and sensitiveness of the soles of the feet (Kuper, Fisher, 1945) warts, itching, and prurigo. This latter condition is characterized by localized itching and small nodules forming as a rule on the outer surface of the arm or on the neck. These disorders have been identified as psychosomatic either because they start or become worse during stress situations or because they improve or are cured by psychotherapy, at times of the hypnotic type.

ACNE

Acne is a disorder of the skin of the face and of the back consisting of the formation of pimples in an oily skin. It usually starts after puberty and very frequently disappears spontaneously. In other instances it persists. X-ray treatment is very effective in changing the texture of the skin so that the disorder disappears. Nevertheless this is in part a psychosomatic disorder. In some individuals, acne appears during stress situations and disappears when the stress is resolved and reappears again concomitantly with the emotional disturbances. Endocrine disturbance very likely forms its background. The psychological conflict centers mainly about the problem of sexual impulses and fear of exposure together with feelings of worthlessness and guilt because of rejection.

URTICARIA

Urticaria (hives) consists of itching and reddening of the skin and the formation of hives which form in one place, disappear, and appear in another place. It usually occurs in attacks, often due to ingestion of food stuffs to which the individual is sensitive. The most common emotional problem encountered in the patient is frustrated dependency longings. (Saul, 1941.) Together with that, there may be desire for exhibitionism or fantasy of returning to the womb. (Mittelman, 1941.) Psychotherapy can be effective. The elimination of the allergic substance from the diet of the subject can also be effective. Adrenalin is administered for immediate relief of the attack.

Experimental Investigations. The experimental investigations demonstrating the correlations between emotional reactions and changes in the skin have been mentioned in various parts of this section. They were (1) increase in palmar sweat secretion; (2) vasoconstriction in the extremities during emotional stress; (3) the production of blisters in hypnosis by the suggestion of touching the hot iron; and (4) the production of swelling of the hand and its disappearance in hypnosis.

Résumé. There is experimental evidence to show that vasoconstriction, vasodilation, swelling, and blister formation may occur in the skin during emotional stress. Excessive perspiration, thickening of the skin, itching, prurigo, acne, and urticaria may appear during periods of stressful life situations and may be benefited by psychotherapy.

REACTIONS IN WHICH GASTROINTESTINAL DISORDERS PREDOMINATE

Loss of appetite, attacks of nausea, "lump in the throat" are common minor symptoms in psychoneurotic reactions and can be distressing as anxiety concomitants or equivalents.

CARDIOSPASM

This condition consists of a spastic contraction of the circular musculature of the cardia (entrance to the stomach). As a result, food accumulates in the lower portion of the gullet which becomes dilated. The symptoms are pain and vomiting. The condition is correlated with anxiety states and hostile rejection of food as a token of affection with strong desire to accept

it. ("I cannot swallow this situation.") (Weiss, 1944.)

Experimental Investigation. While being observed with the oesophagoscope, the oesophagus of a patient relaxed when he was assured that he would get a job and his home situation would be straightened out. Total spasm of the oesophagus recurred when he was asked what he would do if he had to remain poor and unemployed. (Faulkner, 1940.)

PEPTIC ULCER

A peptic ulcer is a small wound which develops either in the stomach itself or in the duodenum, the portion of the bowels immediately below the stomach. The patient complains of recurrent pain in the upper abdomen usually when the stomach is empty; the taking of food usually relieves the discomfort.

The most common personality type seen in this disorder, is that of the ambitious, hard driving, emotionally controlled individual. (Draper and Tourain, 1932.) The conflict situation is resentment, anxiety, and guilt over frustrated strivings for achievement, self-esteem, and dependence. (Alexander, Bacon, and Levey, 1934.) The stomach complaints finally represent the results of wanting love through being fed, attacking through devouring, and a plea of helplessness through suffering. (Mittelman and Wolff, 1942.) The physiological predisposition is undetermined.

Physical therapy consists of dieting (milk, cream, eggs) which is usually promptly effective, and of the administration of medicines which bind the acidity of the stomach. Psychotherapy should always be given.

Experimental Investigations. In experiments with fleeting standardized stimuli, it was found that the tension and peristalsis of the stomach increases slightly in pleasant and affirmative emotional situations and diminishes slightly during unpleasant emotional experience. (Brunswick, 1924.)

In combined experimental and pathological investigations, anxiety, resentment, and pleasure producing experiences were suggested to subjects in hypnosis. It was found that acid secretion at times increased, at times decreased, during the same emotion in different subjects, but the reaction of each subject was constant for each emotion. (Witkower, 1935.)

Extensive investigations were conducted on

normal individuals, on individuals in anxiety states, with a burning in the stomach as the chief complaint, and on patients with peptic ulcer, using discussion of life experiences as stress stimuli. The gastric secretion was obtained through a nasal catheter, the stomach motility was registered by means of a swallowed, inflated balloon connected with a tambour. It was found that the secretion of hydrochloric acid and peristalsis of the stomach increased during mixed reactions of anxiety, anger, embarrassment, and guilt. In patients with peptic ulcer, pain appeared together with these phenomena. In one of the subjects, after a period of most intense anger, blood appeared in the contents of the stomach, indicating changes in the circulation also. (Mittelman and Wolff, 1942.)

In a subject who, as a result of an operation, had an opening of the stomach in the abdominal wall, extensive observations were made on the correlation between emotional reactions and gastric function. During panic reactions there was a temporary paling of the mucous membrane of the stomach and diminution of secretion and peristalsis. During anger and anxiety, there was an increase in the same functions and a blanching and swelling of the mucous membrane. In such a state, the mucous membrane was easily injured. If the mucous was kept away from a wound in the stomach wall, the wound did not heal but developed into an ulcer. (Wolf and Wolff, 1943.)

Résumé. There is experimental evidence that gastric motility, secretion, and circulation may increase during anxiety, anger, embarrassment, and guilt. In this condition, the mucous membrane of the stomach may be easily vulnerable and an ulcer may form. Complaints of peptic ulcer often arise during periods of emotional stress. Psychotherapy may be a useful adjunct in treatment.

DIARRHEA, MUCOUS COLITIS, ULCERATIVE COLITIS, AND CHRONIC CONSTIPATION

Mucous colitis is characterized by frequent bowel movements or constipation accompanied by pain and discharge of mucous and at times blood. (In ulcerative colitis, ulcers are also present.) Mucous colitis correlated with resentment, anxiety, and guilt in 53 out of 57 cases studied and is to be considered a psychosomatic condition. (White, Cobb, and Jones, 1939.) So

is ulcerative colitis if there is no serious primary infection present. A common stress situation in the latter is that of frustrated dependency with hostility and suicidal trends. (Daniell, 1940.) The emotional formula in diarrhea may be "I am giving of myself to the world; I deserve to be looked after." Ulcerative colitis is a very serious illness and may end in death. The treatment is dietary and medicinal. Psychotherapy may be effective.

Chronic constipation is characterized by infrequency and hard consistency of spontaneous bowel movements. The psychological formula is the opposite of that of diarrhea: "I am not receiving love and care, therefore I will give nothing to the world." (Wilson, 1934; Levine, 1934.) Constipation at times arises passingly during periods of stress, at other times it is a chronic condition, and at times it alternates with diarrhea.

HEMORRHOIDS AND FISSURES

Hemorrhoids and fissures of the anus may arise as complications of both diarrhea and constipation. The condition can further be aggravated by a tight sphincter muscle, which spastic state is correlated with the emotional tension.

The experimental evidence indicates that the colon may become spastic (contracted) or atonic (too relaxed) in periods of emotional stress.

OBESITY AND ANOREXIA NERVOSA

Cultural patterns as regards the desirability of stoutness or leanness vary with cultural groups and with the period of time. This applies particularly to women.

OBESITY

Excessive eating is a method of relieving emotional tension by using pleasure in food and devouring as consolation and by substituting food for affection (Bruch, 1940) and for sexual gratification. Overweight may result secondarily in moderate rise in blood pressure, in irregular menstrual periods, and in a slight lowering of basal metabolism. If the patient can diet successfully, these effects disappear.

ANOREXIA NERVOSA

As a rule observed in women, anorexia nervosa (Gull, 1884) is characterized by vomiting, loss of appetite, considerable loss of

weight, low basal metabolism, and the stoppage of menstruation. The condition if untreated can be fatal. The patients are usually uncooperative, irritable, and hostile (Rahman, Richardson, and Ripley, 1939). Often for many years the patients were overeating and were stout, then started to diet in order to reduce, and finally developed anorexia nervosa. The usual conflict situation is resentment towards the mother because of feelings of rejection and rivalry together with fantasies of oral impregnation. At first the emotional tension is resolved by overeating, food being substituted for affection. However, the resultant obesity represents humiliation, exposure, and anticipated rejection by men. The dieting at first is an attempted remedy of these secondary consequences but finally ends up in the rejection of food as a symbol of affection and of sexuality. (Waller, Kaufman, and Deutsch, 1940.) Glandular predisposition, either in the direction of obesity or anorexia nervosa, is a controversial question. With symptoms developed there may be an excess of the gonadotropic (anterior pituitary) hormone (McCullough and Tuffer, 1940) and either an excess or a deficiency of estrogenic hormone. (Moulton, 1942.) Psychotherapy is difficult but can be successful.

REACTIONS WITH DISTURBANCES IN SUGAR METABOLISM

Diabetes (Hyperglycemia). Diabetes consists of continuous elevation of the sugar above 120 mg. in 100 cc. of blood, which usually spills over into the urine and at times leads to acidosis and, if untreated, to coma. The condition is due to an insufficiency of the hormone of the pancreas which controls sugar metabolism. It is a common observation that during periods of anxiety the amount of sugar in the blood and urine increases in spite of a standardized diet. Depression is a common symptom. (Menninger, 1935.) The conflict situation in individuals studied in detail is that of fear of being overpowered and injured because of hostile, rebellious and sexual strivings. (Daniels, 1936.)

HYPOGLYCEMIA

If the blood sugar falls below a certain level (sixty to forty mg. per 100 cc. of blood) confusion, dream states, and manic excitement may appear. Marked lowering of the blood

sugar is usually due to an over-functioning of the pancreas caused by a benign tumor (adenoma). However, a less dramatic fall in blood sugar level may be correlated with personality problems and emotional reactions. It may occur during conditions characterized essentially by motor tension but at times also by depression. Attacks of extreme weakness, tremulousness, sweating, and vertigo may occur (Rennie and Howard, 1942). It may also be correlated with a syndrome characterized by consistent and prolonged feeling of fatigue. This latter syndrome has been called hypoglycemic fatigue (Szondi and Lax, 1929; Alexander and Portis, 1944.) The outstanding features are apathy, aimlessness, and a repulsion against the routine of everyday life. The fatigue is chronic or it appears in acute attacks.

The psychological picture represents a reaction of disappointment and defiant self-incapacitating refusal to be active: "I cannot have what I want; I will not play any more."

Experimental Investigations. Cannon's observation (1915) of the appearance of sugar in the urine during fear and rage has been mentioned. For the demonstration of hyperglycemic, as well as of hypoglycemic reactions, the so-called sugar tolerance test is a more sensitive procedure than a single determination of the blood sugar under basic conditions. Either 50 or 100 grams of dextrose are administered by mouth or one-third gram of dextrose is injected into the blood per kilogram of body weight. Blood samples are withdrawn a half hour, one hour, 1½ hours, two hours, and sometimes three hours after the administration. In the normal individual, there is a moderate rise in blood sugar for about one hour, with return to the previous level after two hours. In psychoneurotic and psychotic patients, anxiety, tension, fear (particularly panic reactions), as well as resentment, hate, and anger, may be accompanied by an increased level of the blood sugar during fasting; together with that, or often even when the fasting level is normal, the curve for dextrose tolerance may be elevated. (Diethelm, 1936.) In the hypoglycemic states described above, the dextrose tolerance curve shows a lack of rise in blood sugar or an actual fall during periods of psychiatric symptoms. If psychiatric management relieved the condition, the "flat" tolerance curves disappeared. (Rennie and Howard, 1942.) The injection of atropine,

assumedly through inhibiting the vagus nerve which stimulates secretion of insulin, relieves both the hypoglycemia as well as the fatigue. (Alexander and Portis, 1944.)

Treatment. The physical treatment of diabetes consists of dieting and the administration of insulin. Psychotherapy may diminish the amount of insulin needed. Psychosomatic phenomena of hypoglycemic reactions may be relieved by psychiatric management. However, the administration of atropine may cut short the vicious circle of fatigue, the resultant disappointment in oneself, and guilt. Relief of the patient's symptoms may increase his hopes and make him more amenable to psychotherapy.

Résumé. There is experimental evidence to indicate that the blood sugar level may be elevated under basal conditions or during dextrose tolerance test in states of fear and anger; and may be lowered during states of tension with depression and fatigue. Psychotherapy may be beneficial in diabetes as well as in hypoglycemia.

REACTIONS IN WHICH DISTURBANCES OF THE URINARY BLADDER PREDOMINATE

Enuresis, Difficulty in Voiding, and Frequency of Urination. Enuresis, not uncommon in children, consists of involuntary voiding, as a rule in sleep; hence it is commonly called bed-wetting. The mechanism of voiding consists of a simultaneous contraction of the longitudinal muscle of the bladder, relaxation of the sphincter (circular) muscle of the bladder and urethra, and, during part of the time, contraction of the abdominal muscles. At times the opposite process is observable in adults, namely difficulty in starting the stream because of inability to relax the sphincter muscle. Frequency of urination, when it is not connected with increased urinary secretion, consists of the urge to urinate even when there is relatively little urine in the bladder. All three symptoms may occur concomitantly with anxiety reactions. Enuresis and frequency often are connected in addition with psychological equating of sexual and urinary function or, in children in response to the birth of a new sibling, they are sadistic substitutes for self-assertive aggression. (Despert, 1944.) Difficulty in starting the stream in addition is connected with embarrassment and shame and the feeling of exposure. This occurs mainly in public toilets. If frequency of urination is severe and persists over many

years, the bladder may finally shrink. This, however, happens very rarely.

Treatment Is Psychotherapy. Improvement of bladder control in children by conditioning has been achieved on a limited scale. There is an electric circuit that gets closed by moisture and a bell rings. After such repeated occurrences, the child wakes spontaneously in response to the urinary urge.

Experimental Investigations. Excitable monkeys, when frustrated, in addition to increased motor behavior, also defecate and urinate.

It is extremely rare that a normal dog urinates in the experimental room or on the stand, even though he may be kept there for seven hours or more. Dogs with experimental neurosis may urinate as many as thirty times an hour—anywhere in the experimental environment, not infrequently on the food. (Gantt, 1942.)

REACTIONS IN WHICH SEXUAL DISTURBANCES PREDOMINATE

The psychosomatic problems connected with sexual activity can be divided into sexual disturbances correlated mainly with changes in life situation and those correlated with primary hormonal changes.

HORMONAL UNDER-FUNCTIONING

In either sex, diminished supply of hormones may come (1) from inadequate development, (2) from operative removal of the gonads, (3) from decline in function because of age. In all of these conditions there are both similarities and differences between the male and the female sex. Inadequate or delayed development is apt to be more disturbing in the male. Operative removal may be equally disturbing in both but more so in the male. Decline in functions because of aging is likely to be more disturbing in the female.

Disturbed Development. Adiposogenital Dystrophy: Inadequate sexual development is usually due to inadequate functioning of the anterior lobe of the pituitary gland. At times it is associated with inadequate growth and underweight. A more common syndrome is characterized by overweight, low basal metabolism, and at times undescended testes. In either condition, the psychological picture may be the result of lack of drive together with a retreat into a passive, submissive role, seeking maternal protection and preferring to play with girls. The

condition is associated with feelings of inadequacy and the feeling of having been injured (castrated). At other times, a reaction develops against these attitudes and a hostile, attacking, defiant behavior results. (Mittelman, 1938.) Physical treatment consists of thyroid substance by mouth and the injection of anterior pituitary sex stimulating, and particularly of male sex hormone (androgen). In the majority of cases, this treatment leads to adequate development. Psychotherapy is needed at times to eliminate the after-effects of the condition. (Mittelman, 1938.)

Surgical Removal of the Gonads. This usually results in the male in feelings of inadequacy, diminished interest and drive. There are, however, cases on record which show that even such a reaction has a large psychological component, because under favorable circumstances, some patients are able to continue, or recover adequate sexual activity if the removal took place after reaching adulthood and engaging in full sexual activity. With this, the lack of drive disappears. The injection of androgen (testosterone) restores adequate sexual activity. In the woman, the removal of the ovaries has the same effect as the decline in function because of age.

Menopause. The condition is characterized by cessation of menstruation and not infrequently by the appearance of hot flushes with excessive perspiration, dizziness, headaches, irritability, and depression. The hot flushes and the excessive perspiration are very likely due not to diminished estrogenic sex hormone but to excess of anterior pituitary hormone. Sexual receptivity and orgasmic ability are retained in the healthy woman after menopause. The psychological symptoms are the result of a combination of direct effects of the endocrine imbalance and of the individual's reaction to these changes. The endocrine changes represent a double threat: (1) distressing, uncontrollable bodily symptoms, and (2) aging and the final loss of fulfillment of life-long longings. The administration of ovarian follicular hormone is largely effective in removing the physical symptoms. Additional psychotherapy eliminates psychological symptoms also. In severe depression, electroshock treatment is effective in a considerable proportion of the cases (see later).

In the majority of cases, decline of sexual function in the male is very gradual and causes

no serious disturbance, although in some instances depression occurs. The decline in function can be remedied by the injection of testosterone.

Psychogenic Underfunctioning—Frigidity and Impotence. In the overwhelming majority of cases, impotence in the male and frigidity in the female are psychogenically determined. The most common form of impotence or disturbed potency in the male is inadequacy and short duration of erection with a premature occurrence of ejaculation. Rarely, the disturbance manifests itself in inability to reach an ejaculation. In the female, frigidity as a rule means either inability to reach an orgasm through vaginal stimulation or even through clitoral stimulation or, in milder instances, there is difficulty in reaching an orgasm in either way. In severe instances, there is in addition disgust experienced towards the sexual act. At times, orgasm is experienced by, or is more enjoyed by masturbation or by homosexual contact. The average time required by healthy individuals to reach sexual climax is two to 15 minutes. The physiological changes occurring during orgasm are not well known, particularly in the woman. There is increase in pulse rate, increased perspiration, deep breathing, general muscular contraction followed by general relaxation and not infrequently sleep. Even in the presence of these reactions, there may be inadequate subjective enjoyment and inability to relax and feel satisfied after the occurrence. Disturbances in potency are correlated with total personality problems of very complex nature. The dominant aspect is fear and reluctance to reach out towards the other individual, hostility and fear of counter-attack, particularly in the form of genital injury. The treatment is psychotherapy.

Premature and Over-function. The only primary pathological glandular sexual over-function is the one observed in premature sexual development as a result of tumors of the gonads or of the cortex of the adrenal gland. In such rare instances, the children show all secondary sexual characters and the premature development of the penis, the girls menstruate, and both sexes may show active increased desire for sexual behavior. The treatment of the condition is operation.

Some manifestation of sexual activity and

sexual interest is normal before puberty. Excessive masturbation, e.g., daily or several times a day in children or after puberty, is a psychogenic disturbance. So is promiscuity and continuous drive for sexual relations. The emotional background for these disturbances is a total personality disturbance in which three aspects may predominate: (1) using the sexual activity as a means of attaining other emotional goals such as self-magnification or love; (2) a compensatory overactivity against fear of genital injury; and (3) a defiant reassertion of the pursuit of a forbidden goal. Treatment is psychotherapy of the individual and of his environment.

Perversions and Homosexuality. The definition of perversion is somewhat difficult because cultural customs and preference play a large role. In our cultural set-up, perversion could be roughly defined as alteration in the aim of sexual activity where the ultimate goal is not genital union with a heterosexual object. Perversions are predominantly psychogenically determined, although the tendency for it may be facilitated by relative innate propensity for the use of one or another organ, the function of which is a source of pleasure (mouth, excretory organs). The difficulties represent disturbances of the total personality in which the following aspects may predominate: (1) substitution of one function for the other because it is considered unconsciously less dangerous; and (2) defiant assertion of a forbidden impulse.

Homosexuality. Homosexuality, in its fully developed form, consists of genital gratification by one of the individuals of the same sex. The physiological background, e.g., hormonal imbalance, either as a determinant or as increased tendency, is uncertain. In the majority of instances, there is no evidence either for a predominance of the hormones or of secondary sexual characters of the opposite sex. Psychogenically the disturbance represents a total personality disturbance in which the following aspects may predominate: (1) fear of the opposite sex in terms of injury and humiliation; (2) the fear of results in rejection of the opposite sex, but the desire for closeness makes the individual turn to members of his own sex who are also feared, but less so; (3) as a result of developmental problems, identification with a member of the opposite sex; (4) submission to

the feared member of the same sex by way of obtaining love, support, and forgiveness; and (5) defiant assertion of a forbidden impulse. The only present known treatment is psychotherapy, both for perversions in general and for homosexuality in particular. It is often a difficult task, because these disturbances have a very great value as sources of pleasure. However, it is often successful if the individual is deeply dissatisfied with his sexual activities and has a strong desire to change them.

Disturbances Connected with Menstruation. Menstruation is one phenomena in the cyclical changes of the female hormonal activity. The disturbances comprise either diminished or absent menstrual flow, excessive menstrual flow, or increased psychological distress in connection with menstrual flow. The cessation or excess of menstruation may be connected with primary disturbances in hormonal function. One of the most important of these, namely menopause, has already been discussed. Here three syndromes will be presented particularly:

Premenstrual or Menstrual Tension. Premenstrual tension is the more common of the two. It consists of moodiness, irritability, and in more severe reactions, anxiety states. As a rule the symptoms disappear when menstruation begins. In other instances, however, the symptoms continue or become intensified during menstruation.

If the symptoms are severe, they represent total personality reactions. The dominant features are (1) reaction to an unlocalized tension; and (2) rebellion against the feminine role and increase in anxieties centered around interhuman relations as symbolized by the feminine role. At times the hormonal level (see below) is excessively high or remains high when it ought to decline, in such patients. (Benedek and Rubenstein, 1939.) It is difficult to decide in such instances to what extent this characteristic of the hormonal level is psychogenically determined.

Cessation of Menstruation. Temporary delay in menstrual period is not infrequently seen as occurring correlated with stress situations. Of rarer occurrence is "false pregnancy" (pseudocyesis) in which the woman does not menstruate for many months, together with presenting enlargement of the abdomen due to accumulation of gas. There is an excess of

gonadotropic (pituitary) and a diminution of estrogenic (follicular) hormone (with persistence of the corpus luteum) as in pregnancy. (Moulten, 1942.) The psychogenic background of the disturbance is a fantasy of being pregnant, that is, the desire for a child. However, desire for a child that is accompanied by such phenomena is a total personality reaction, and pregnancy represents a desperately desired fulfillment of the role as a woman or the idea of self-sufficiency, possessing everything within oneself, including the male organ ("narcissistic" desires), and the desire to be looked after. These factors may dominate the picture in temporary cessation of menstruation also. Another dominant element in that situation is a plea of helplessness, together with the need to be looked after as an expectant mother.

Dysmenorrhea (Painful Menstruation). The pain is cramplike in character and is due physiologically to increased contractions of the uterus occurring mainly on the first day of menstruation. Some women suffer from it at each period, some only when they are under emotional stress, still others are free from such complaints. The physical condition at times shows underdeveloped uterus and at times possibly insufficiency of progesterone (corpus luteum hormone) or excess of estrogen (follicular hormone)—but neither is constant or definite. Psychologically, there may be fear of the feminine role and particularly equating menstruation with being attacked and injured. The symptom often improves or disappears in the course of psychotherapy. Medicinal treatment consists mainly of analgesics and sedatives.

Experimental Investigations. The following experimental results have been obtained on animals and human beings: (1) If the gonads are removed operatively in either the male or the female animal, with rare exceptions the animal ceases to exhibit sexual activities. (2) The injection of hormones in adequate amounts restores sexual activity. Regardless of his original sex, the animal exhibits more readily the type of behavior which corresponds to the hormone injected. (Steinach, 1911.) However, under certain circumstances, the operated or unoperated animal may exhibit either type of behavior. (Ball, 1939.) (3) The injection of hormone into the healthy sexually functioning animal increases his or her sexual activity in a signifi-

cant percentage of experiments. (4) Passing homosexual activity, such as mounting another male or, conversely, lordosis and quivering of the ears if mounted, can be observed in male rats if they are hyperexcitable as a result of hormonal injections or if they were previously frustrated and no member of the opposite sex is available. (Beach, 1942.) (5) Some features of passing homosexual behavior can be observed in monkeys on the part of both the dominant and the submissive male or female. Thus the submissive male monkey may assume the female copulative position toward the dominant male, and the dominant male may mount the submissive male. (Maslow, 1936.) At times the female animal who is otherwise submissive to the sexually responsive male becomes dominant, and the sexually desirous male becomes submissive. (6) Dogs with experimental neurosis induced by the conditioning method may show frequent and almost constant erections reactive to the environment and particularly the specific signals formerly connected with food. Further, in normal dogs the conditioning environment has no effect upon the onset and duration of erection in response to normal sexual stimuli. Neurotic animals exhibit premature ejaculation in that the duration may be decreased to one-third of the animal's normal performance. (Gantt, 1942.) (7) Simultaneously with vasoconstriction and excessive perspiration in the extremities during emotional stress, the penis may become small, moist, and cool. (Mittelman, 1939.) This phenomenon of anxiety may interfere with adequate erection which is mediated mainly through increased blood-filling of the organ. (8) Erection has been observed in infants in response to nursing and frustration. (Halverson, 1940.) (9) The correlation between the sexual cycle and the psychological attitude has been investigated in women by simultaneous examination of vaginal smears, the daily measurement of the body temperature, and of the difference in the electric potentials between the tips of index finger on the one hand, and the productions of the subjects in psychoanalytic interviews on the other. The period in the sexual cycle can be determined by the shape and character of the epithelial cells and presence of leucocytes in the vaginal smear. (Papanikolau, Shorr, 1936.) There is a slight fall in body temperature and a rise in the difference between finger potentials corre-

sponding to the day of ovulation. When these changes were correlated with the psychoanalytic productions, the following was found: After menstruation, while estrogen follicular hormone predominates, there is a corresponding active heterosexual striving. After ovulation, the predominant attitude is self-admiration and self-satisfaction and desire to be taken care of. In the next phase, progesterone (the corpus luteum hormone) predominates. The corresponding attitude is passive receptivity and the desire for pregnancy. Just before menstruation, as the corpus luteum hormone declines, the predominant attitude is that of elimination; excretory dreams make their appearance. If the individual is afraid of any of these tendencies, particularly the heterosexual and the receptive trends, overt anxiety and nightmares or hostile counterattacking, violent castrative trends occur. (Benedek and Rubinstein, 1939.) There is an outburst of physical and mental activity before the onset of menstruation, coupled with high tension and irritability and preceded or accompanied by depression. Another high inactivity dominates the ovulative phase of the cycle, but this is free from tension and the mood is that of elation. (Altmann, Knowles, and Bull, 1941.)

Résumé. There is experimental evidence to demonstrate there is a correlation between the presence and the level of sex hormones and sexual and psychological activities. Sexual activity may change in correlation with alterations of life situations. The primary hormonal disturbances, such as menopause or hypogonadism, are correctable by the administration of the gonadal hormones together with psychotherapy. Disturbances in potency are accessible to psychotherapy.

REACTIONS IN WHICH DISTURBANCES OF THE EYES PREDOMINATE

A variety of eye complaints connected with personality disturbances may occur during life stresses: "spots before the eyes," pain during sustained eye work. Hysterical blindness has already been mentioned. Here one of the serious eye disturbances will be discussed.

Glaucoma. This condition is characterized by an increase in the intraocular pressure (pressure within the eyeball). If the condition is severe enough and lasts long, the individual may go blind as a result of the atrophy of the optic nerve. The condition, increasing in frequency

with advancing age, is probably due to disturbance in the blood vessels in the iris. The personality type and the conflict situation have not been investigated in detail, but the pressure usually rises during periods of worry, shame, and resentment. (Cobb, 1944.) The treatment consists of eye drops (eseron) which make the pupils contract and thus improve circulation. At times operation is necessary. Psychotherapy is helpful in addition.

REACTIONS IN WHICH DISTURBANCES OF THE JOINTS PREDOMINATE

Rheumatic Fever and Rheumatoid Arthritis. Rheumatic fever consists of acute inflammation of the joints, accompanied by redness, swelling, pain, and rise in temperature. The inflammation affects one joint after another. The heart may become affected, too, because of inflammation of its inner lining membrane. The attack may last several months. Rheumatoid arthritis at times starts the same way, but more frequently it develops gradually with pain and stiffness in some of the joints. As a rule the process does not wander from one joint to another in a single attack. The heart is very rarely affected. The rheumatic fever is undoubtedly an acute infectious disease caused by a streptococcus. The nature of the various forms of rheumatoid arthritis is not exactly known. It commonly develops between the ages of forty-five and sixty. Focal infections, e.g., infected tonsils or abscessed teeth, often play an important role. In some instances endocrine factors are likely to be present. The personality types vary. Common conflicts are rebellion against authority, with the consequent fear and guilt, and the desire to use the extremities for aggressive and sexual purposes. The diseased joints become the representatives of both the fulfillment of the forbidden desires and the punishment for them. Thus a vicious circle is set up. (Dunbar, 1945.) The physical treatment for rheumatoid arthritis consists of rest in bed and the administration of salicylates. In rheumatoid arthritis the treatment is the same in the acute period, with massage and the general raising of the patient's resistance in the chronic period. There are no psychosomatic experimental investigations of these disorders. It is likely, however, that vasoconstriction in the extremities plays an important role. (Mittelman and Wolff, 1939.) A further possibility is that the individ-

ual exposes himself to injurious situations—e.g., cold and damp without adequate clothing—as a result of rebellion or desire for self-injury.

REACTIONS IN WHICH ADDICTION TO DRUGS PREDOMINATES

The psychological reaction to chemical agents is determined by the special nature of the drugs, on the one hand, and the subject's personality, as well as immediate psychological constellation, on the other. (Mittelman, 1945.) Thus the psychological and psychosomatic effects of sodium amytal, alcohol, nitrous oxide, and marihuana may vary from subject to subject or from occasion to occasion in the same subject.

One may speak of addiction if the substance is used habitually—contrary to group habits—in relatively large quantities, and if it has deleterious effects. The most common substances thus used are alcohol, morphine (opium), cocaine, and marihuana (hashish). The most difficult ones to discontinue of these are morphine and cocaine. After prolonged use of drugs, characteristic psychotic reactions may develop.

The unconscious fears that are characteristic of addictions are of unbearable and catastrophic humiliation, particularly after failure, and complete submission and destruction, especially after the individual has sought relief from anxiety through homosexual submission.

The most commonly used intoxicant is alcohol. Its use has the following "ameliorative" effects: (1) consoling pleasure through the use of the mouth and the taste (Rado, 1932); (2) expression of hostility at sexual desires, during intoxication, which are ordinarily inhibited; (3) elation which helps the individual to forget his difficulties.

Treatment of moderate alcoholic addiction is psychotherapy. For severer alcoholic addiction the patient has to be in an institution. Use of sedatives and circulation stimulants may be necessary. Subsequent psychotherapy may prevent relapse.

Experimental Investigations. Experimental investigations are difficult to conduct because the social and psychological environments are hard to duplicate. Results of the association test will illustrate the effects of alcohol. The number of responses elicited in the same individual without alcohol was smaller, but the responses were of a distinctly superior quality, more logically

associated with the stimulus. For example: to the stimulus word *butter*, normally such response words are produced as *cheese*, *bread*, *yellow*; that is, words designating objects or qualities which in their origin are connected with the object designated by the stimulus word. After taking a glass or two of whiskey, the stimulus word *butter* may evoke such responses as *bitter*, *flutter*, *butterfly*; that is, words related to the sound and form of the stimulus word rather than to its meaning. These findings can be interpreted in the following two ways: (1) That alcohol diminishes the efficiency of the subjects in responding relevantly to a test of association. (2) That alcohol produces relaxation in the subjects; this is apparent in the ease of production of a larger number of "nonsense" responses. And, finally, some inhibited subjects respond freely and with relevance only with alcohol because of release from self-consciousness; this is apparent in the occasional individual who shows qualitatively improved production.

Cats with experimental neurosis induced by the conditioning method respond again adequately to stimuli after ingesting a small amount of alcohol. (Masserman, 1943.) This phenomenon may parallel the restorative effect mentioned in the human being. However, what obviously happens in alcoholism is this: With the quantity of alcohol increased, the repressed emotional disturbances overwhelm the subject.

Marihuana produces in small doses increased talkativeness, less inhibited motor behavior and speech if a conversation is kept up with the subject. Habitual users, however, after being given the same dose in a group experiment, sit quietly, get annoyed if somebody disturbs them, and laugh readily at jokes. In larger doses the drug often produces passing psychotic reactions: paranoid fear states and excitement.

Dogs have been experimentally addicted to morphine by regular injections. When the injections were discontinued, they exhibited similar symptoms to those exhibited by human beings during acute withdrawal: restlessness, salivation, diarrhea, circulatory disturbances, and collapse.

Résumé. Experimental and clinical evidence illustrates that the effect of drugs is determined by the nature of the drug and the subject's emotional reaction patterns. The initial use of the drug may be for restorative purposes with

quantities increased, and, with certain constellations, the repressed emotional forces dominate the picture. However, many of the drugs used habitually lead to addiction for biophysiological reasons also. In moderate alcoholism, ambulatory psychotherapy is often effective. Severe alcoholism, as well as morphine or cocaine addiction, requires institutional treatment.

REACTIONS IN WHICH DISTURBED FUNCTION OF THE THYROID GLAND PREDOMINATES

The psychological problems connected with hypothyroidism and hyperthyroidism have been discussed. Here a special syndrome will be presented.

Exophthalmic Goiter. Exophthalmic goiter is a condition in which there is enlargement of the thyroid gland and a considerably increased metabolism (up to +100), bulging of the eyes, trembling of the fingers, loss of weight, rapid heart rate, excessive perspiration, and other symptoms. The main psychological symptoms are due to an overfunctioning of the thyroid gland. This condition was found to be precipitated by reactions to life situations in fifty-six out of sixty unselected patients studied, i.e., in 93 per cent of the cases. (Mittelman and Conrad, 1933.) The most common conflict situation is guilt and fear of abandonment and of injury resulting from resentment over frustrated dependency longings. Three personality types are encountered: emotionally labile, overtly dependent and demanding; emotionally controlled, with high ideals of responsibility; and aggressive hard-driving, with high level of activity. The patient reacts to the thyrotoxic with fatigue, restlessness, and irritability; further either with self-condemnation and fear, or the illness is utilized for more open expression of hostility. Thus the final psychological symptoms are resultants of (1) original conflicts, (2) over-secretion of the thyroid gland, and (3) personality reactions to the toxic symptoms.

Treatment consisting of bedrest, sedatives, and diet is successful at times. Operative removal of a large part of the thyroid gland, after the toxic symptoms are reduced with iodine, is effective in about 92 per cent of the cases. Psychotherapy should always be given.

Experimental Investigations. It has been mentioned earlier (see "Hypnosis") that pulse rate and metabolism rise during induced fear reactions.

REACTIONS TO PHYSICAL ILLNESS

Convalescence. Psychogenic factors may play a role in the causation of even such illness as pneumonia (exposure) or fracture (reckless act). At other times, such illnesses have no psychogenic determinants. In either instance, however, physical illness represents a psychological problem as well, with which the individual has to cope. Mild irritability, anxiety or depression are not uncommon symptoms. Severe psychopathological reactions are at times precipitated by the occurrence of an illness or an operation. At other times, recovery from such illness as heart failure may be retarded because of emotional stress.

The patient's anxiety may be aroused because the illness threatens his bodily safety and because it incapacitates him temporarily or permanently for the work he is doing. This may, of course, further lead to financial worry. He may consider the illness or the operation, unconsciously, as a punishment for hostility or a dangerous fulfillment of passive, submissive, and masochistic strivings. Bedrest and care may gratify infantile dependency needs, but also stimulate excretory and perverse fantasies and thus arouse guilt and hurt self-esteem. Lastly, the confinement makes strivings of compelling force—e.g., for achievement, superiority—at least temporarily impossible. The patient may experience this as a threat of ultimate defeat and destruction. Recurrence of the same illness within six months or a year may mean to the patient inescapable doom.

The therapeutic conclusion is: The treating physician should be aware of the patient's restlessness or anxiety and discuss it with him at least briefly with adequate reassurance. Equally important is attention to the patient's family, which at times is the main factor in the emotional difficulties. (Mittelman and Richardson, 1944.) At times prolonged psychotherapy may be required.

Experimental Investigations. Four conscientious objectors volunteered to be confined to bed and be put in a cast for the study of the physiological effects of immobilization. They exhibited resentment, dependency longings, rising sexual tension, and difficulty in, preoccupation with, and embarrassment over excretory function. When the cast became recurrently painful and other feelings of discomfort recurred, they

experienced anxiety. Similar reactions occurred when pain and swelling appeared in knees or arches of their feet—structures in which they had suffered injuries or had difficulties with in adolescence. (Mittelman, Brodman, Weider, Wechsler, and Wolff, 1946.)

Résumé. Experimental and clinical investigations indicate that patients may react to physical illness and confinement with anxiety, hostility, increase in dependency needs, and passive masochistic strivings, together with increase in excretory and sexual conflicts leading to fear and guilt. The physical illness may aggravate or precipitate a psychopathological reaction.

REACTIONS IN WHICH EPILEPTIC PHENOMENA PREDOMINATE

Epilepsy is characterized by attacks of unconsciousness, accompanied by violent convulsive contraction of the musculature of the body (grand mal). Less severe symptoms consist of disturbed consciousness in which the patient mumbles or engages in some stereotyped or unusual activity for which he has no recollection when adequate consciousness is regained (petit mal). In rarer instances, fugue states or violent rages occur with subsequent amnesia. The condition is at times symptomatic of some well-defined illness, e.g., tumor or syphilis of the brain. In a large proportion, no clearcut cause can be found (essential epilepsy). The electroencephalogram shows characteristic waves even between attacks or after forced breathing, namely, bursts of "spike and dome" or of high-amplitude, low-frequency waves. (Gibbs, Davis, and Lennot, 1935.)

The personality may be normal and when it is disturbed it is usually self-centered, either with irritability or the need to excel and shine. The meaning of the attack psychologically is violence, loss of control, as well as being overwhelmed. The common conflict situation is fear over the consequences of hostility. Chemical treatment is phenobarbital or allied drugs (dilatant), and psychotherapy is often effective in reducing the frequency of attacks.

PERSONALITY REACTIONS IN ORGANIC BRAIN DAMAGE

The following principles apply to the conditions that will be discussed briefly below:

(1) The psychopathological reactions in the various conditions have many common fea-

tures, but it is equally true that each diagnostic category has fairly characteristic manifestations.

(2) The symptoms result not only from direct disturbance in function as a result of damaged structure, but also from total personality reactions to this disturbance.

(3) Differences in the reactions observed between various diagnostic categories are probably due (a) to the special nature of the disease process and (b) to differences in the structures which the processes usually attack.

(4) Differences between individual patients suffering from the same general illness are likely to be due to (a) differences in previous personality, (b) differences in the structures involved, and (c) differences in the rapidity of the disease process.

The causes of organic psychotic reactions are numerous. Among them are deterioration of the brain substance because of hardening of the arteries due to age; infections of the brain such as syphilis or encephalitis; infections in other parts of the body which are accompanied by fever, such as pneumonia, inflammation of the joints, typhoid fever; toxic substances, such as alcohol, opium, illuminating gas, lead; growths on the brain; injury to the brain; vitamin and glandular deficiency.

The chief symptoms of organic reactions—the chronic in particular—are: (1) Impairment of intellectual functions: comprehension, concentration, orientation, and memory for both recent and remote events. (2) Emotional instability: general irritability, laughter and weeping without adequate cause. (3) Changes in general conduct: carelessness in personal appearance, neglect of responsibilities, disturbance in moral conduct. The acute reaction is that of a delirium; the patient is disoriented, has illusions—i.e., misinterprets his perceptions—has difficulty in focusing his attention, hallucinates, and does not remember what has happened to him. He may be highly excited and have various emotions, particularly fear, or he may be emotionally dull. He cannot carry out certain functions or recognize objects adequately.

In both chronic and acute types the ability to copy simple configurations (Gestalt) is often seriously disturbed. In the following some of the conditions will be listed, together with the most common symptoms, in the fully developed stage, besides those already given:

Arteriosclerotic-Senile Reaction (Hardening of the Arteries of the Brain and Aging of the Brain Tissue). Wandering away from the home and getting lost, hoarding and hiding of small change or of worthless articles, and unsystematized delusion of persecution with hallucination and fear occur not infrequently. Many of these symptoms may represent projections of, or attempts to counteract the feelings of impairment, of age, and the fear of death and punishment for past aggressions.

General Paresis (Syphilis of the Brain). There are four main types characterized by: (1) Dementia—i.e., intellectual deterioration with contentment. ("Feel as well as fish in water.") (2) Depression with anxiety and nihilistic delusions. ("My heart has been removed.") (3) Expansiveness with luxuriant delusions of grandeur. ("Own a thousand houses in New York.") (4) Agitation with great restlessness, continuous activity and combativeness. These may represent in part feelings of guilt and fear of punishment over sexual acts (depression) or remedial attempts against that and the failing functions (expansiveness). The treatment is either inoculation with malaria (Wagner-Jauregg, 1918) or the injection of an arsenical compound (tryparsamid).

Vitamin B Deficiencies—Pellagra. This disorder is characterized by inflammation accompanied by brown discoloration of the skin of the back of the hands, inflammation of the mouth, diarrhea, and nervous and mental changes. The latter are headache, dizziness, irritability, depression, and sleeplessness; in severer cases, anxiety, confusion, and delirium. The condition is due to deficiency of the vitamin B group, particularly of nicotinic acid. The treatment is administration of the vitamins.

Alcoholic Psychoses. 1. Delirium Tremens. Vivid visual hallucination of terrifying animals (snakes and rats), often with the fear of mutilation. These may represent in part symbols of the male organ and result from passive submissive homosexual strivings.

2. Korsakoff Syndrome. Characterized by (a) confabulation: the patient makes up stories that fill up the memory gaps; (b) occupational delirium, with visual and auditory hallucinations of a trivial, everyday nature (e.g., being engaged in workshop). Both of these symptoms may represent simple compensatory wishfulfillment, first by covering up the memory defect,

second by the patient "remembering" or hallucinating what he would like to be doing.

It is likely that alcoholic psychoses are partly caused by vitamin deficiencies.

Brain Tumors (New Growths). The psychological symptoms in brain tumors, like the physical symptoms, may be either general (due to increased intracranial pressure) or local (due to disturbance of special structures where the growth is located). The general symptoms are apathy and confusion.

As regards local symptoms: Visual hallucinations are most common if the tumor is located in the temporal or occipital lobe or in the thalamus. "Lilliputian" hallucinations are frequent in temporal lobe tumors: the patient sees small figures which he usually knows are not real.

Hallucinations of smell are most common when the tumor is localized in the temporal lobe or in the thalamus.

Hallucinations of taste are produced by tumors in the basal ganglia and the thalamus.

Jocularity is most common when the tumor is located in the thalamus or the striate body.

Irritability is most common when tumors involve the striate body on the left side of the brain.

Mental symptoms may appear long before local symptoms when the tumor is in the frontal lobe, because it may not extend back far enough to damage the motor area. (Gibbs.)

Head Injuries. The most common immediate effect of a severe blow to the head is a disturbance of consciousness. In some instances, the patient becomes delirious on regaining consciousness. The patient has an amnesia for the accident.

A common sequel is the so-called "post-concussion syndrome," characterized by headaches, dizziness, irritability, cold and clammy extremities, and anxiety dreams. These symptoms often disappear in a few weeks.

The chronic symptoms in general can be classified as psychotic reactions and changes in personality. The patient with a psychotic reaction may become apathetic and slow; he is often depressed and shows no initiative or is overactive, mildly elated, and witty.

Others may exhibit changes in personality: fatigability, inability to concentrate, irritability, and loss of ambition. Such patients tolerate alcohol badly; their reaction to it is sometimes

a terrific excitement during which they commit acts of violence.

Many of these reactions have in part the psychological implication of resentment over the violence and impairment suffered, fear of its recurrence or withdrawal from the environment.

The treatment after head injury is mainly bed rest and, in case of special complications, surgical measures. The handling of the patient is important on the one hand to keep some from resuming full activity too soon and others from becoming anxious and hypochondriacal. Here psychotherapy may be required. The psychotic reactions are slow in disappearing.

THERAPY

Psychotherapy. The dynamic aims of psychotherapy are: (1) increase in the patient's feelings of self-esteem and security; (2) relief of pent-up tensions such as anxiety, guilt, hostility; (3) increase in insight into his psychological difficulties; (4) increase in self-acceptance; and (5) increased integration and reaching toward positive goals resulting in improved relationships with people and improved ability to use various organ systems of the body for adequate function.

How does successful accomplishment of these goals help relieve psychosomatic disorders? It is clear from various topics previously discussed that (1) from the point of view of the total organism, emotional reactions represent both a psychological experience and an alteration in the function of the various organ systems; (2) reactions to disturbing life situations may be accompanied by disturbed function predominantly in one or another organ system of the individual; (3) the selection of the organ system affected is determined either by a primary pathology in the organ, as in epilepsy, or by illness of the organ system in the past history of the individual, as in asthma, or by special types of conflicts which are particularly suitably expressed through the affected organ system, as in circulatory disturbances of the extremities, or through a combination of all three; (4) since the organ system comes under special stress in connection with difficult life situations, a vicious circle is set up: the disturbance creates new anxiety and stress and preoccupation with the disturbance serves as a substitute for concern with the life situation; both reinforce the al-

tered function; (5) the patient's emotional conflicts are such that no adequate solution is possible. He can neither accept the situation nor act adequately to alter it. He has conflicting needs and impulses, thus there is continuous unresolved tension.

The patient's emotional disturbance has several sources: his disturbed relationship with other individuals, his conflicts within himself, and his memories. In psychotherapy, the pathogenic constellations are resolved. Through the relationship with the therapist, which is unique in its nature in that all subjects come up for discussion without disapproval and counter-attack, the patient's relationship with other individuals and with himself is gradually altered. His memories are brought into the open and the effects that his experiences had on his development are investigated. Thus, his conflicts are relieved, his evaluations of himself and of other people are improved, the displacements of emotional problems are undone, and the continuous state of tension is relieved. As a result he can handle the actual relationships with other individuals better, and he can use his organ systems adequately. In his relationship with the therapist, he reexperiences his past and current problems with a new and improved solution and he carries this improved solution into action in his daily existence.

Forms of Psychotherapy. The effect discussed above can be attained by a variety of procedures, the choice depending on the problems of the individual patient and the exigencies of the situation:

(1) *Interview Therapy.* The interviews are approximately of an hour's duration and usually take place once a week. The therapist encourages the patient, by sympathetic listening and skillful guidance, to talk about his problems. The symptoms are discussed only part of the time and then mainly in connection with the life situations in which they made or make their appearance. The patient's whole adjustment, day-to-day experiences, and past history are discussed. This type of therapy may be continued from a few weeks to a year or more.

In special situations, one to three interviews can be effective in relieving the patient's symptoms for a long period of time. This can be achieved particularly if the patient's problems

can be formulated to him clearly and he can arrive, with the help of the therapist, at an improved mode of living. (Meyer, 1906.)

(2) *Psychoanalysis.* The interviews are frequent, commonly five times a week. Free association, dream analysis, the patient's reactions to the therapist are utilized. Every significant topic comes up for discussion, not only because the patient brings them up, but also because the analyst has an opportunity to observe the patient's reactions from interview to interview in a subtle and detailed manner. Even when quick initial results are obtained in psychoanalytic treatment, the treatment continues for a long period because the patient's whole interlocking system of reaction patterns is to be disentangled and resynthesized. Analysis can succeed where the other procedures have failed and its ultimate results are more extensive. However, not all patients are analyzable. (Freud, 1906.)

Two other forms of psychotherapy, or their combination with chemotherapy, are less well standardized and are in limited use.

(3) *Hypnosis.* The patient is hypnotized by suggestions that he is drowsy, that he is getting relaxed and falling asleep. Some patients go into a deep trance, others exhibit varying degrees of hypnotic phenomena. Hypnotic technique can be used in connection with other forms of psychotherapy in the following ways: (a) suggestions are given to reinforce the therapeutic effect of the interviews; (b) memories are obtained from the patient in connection with his symptoms, then these memories are discussed in the waking state. This is possible only in deep hypnotic trance, whereas the first can be done even in superficial trance.

(4) *Group Therapy.* The group consists of three to ten patients, at times more. Some therapists prefer to have patients in the groups who all suffer from the same illness. Group therapy can be very factual and consist mainly of lectures explaining the emotional origin of the symptoms and the physiology of how the emotional reaction leads to disturbed organ function; but it can consist of the discussion of the intimate life problems of the subjects the same way as in individual therapy. Group therapy has one special therapeutic feature, namely it removes the feeling of uniqueness and that way relieves considerably the feeling of

inadequacy and anxiety from which the patients are suffering.

Combined Use of Psychotherapy and Chemotherapy. This combination is of two types: In one, the chemical agent is used to facilitate the psychotherapy. It is given during the psychotherapeutic session. In the other, the chemical agent, or at times physiotherapy, as in arthritis, is given along with psychotherapy.

Narcoanalysis. All the agents used to facilitate the psychotherapeutic procedure are sleep producing agents if given in larger amounts. They diminish, by the chemical route, self-control and self-criticism. As a result, the psychological material may be revealed more immediately and more directly and the experience may be relived in a more vivid fashion. The agents used most commonly are sodium amytal and sodium pentothal. Nitrous oxide and chloroform have also been used. The interview usually lasts an hour and the relief at times is almost immediate. At other times subsequent interviews without the use of the drug have to take place or the use of the drug has to be repeated. These chemical agents can be used to resolve difficult repressive situations during psychoanalytic treatment. (Kubie and Margolin, 1944.)

The Use of Chemical and Physical Agents Along with Psychotherapy. The various procedures in use have been discussed in connection with the various syndromes. The following additional remarks are in place: The exact relationship between the two procedures in the patient's emotional life has not been adequately worked out. On the one hand, the patient considers the use of the chemical agent as a kind of magic and then may expect the same kind of procedure of the psychotherapist to an intensified extent. On the other hand, the cutting of the vicious circle, as in hypoglycemic fatigue, makes the patient more accessible to psychotherapy. It also seems that, at least in some instances, patients who reject psychotherapy otherwise are willing eventually to enter it with the physician who handles both the physical and the psychological problems. (Daniels.)

Observation on Animals. Human psychopathology and therapy is more complex than that of any of the animals discussed, partly because of species difference and partly because stress situations saturate the patient's daily life over

long periods. However, the parallel with some therapeutic observations on animals made "neurotic" by the conditioning method is of interest. (1) Some animals recover in their general behavior and again react adequately to the conditioning stimulus if they spend a longer period away from the experimental environment. Some animals, however, do not recover for years and nearly all relapse quickly if they are exposed again to the stress situation. (Pavlov, 1904; Liddell, 1935; Gantt, 1942; Masserman, 1943.)

(2) Some dogs recover if sedative medication (bromides) is given to them regularly and some cats if they ingest alcohol regularly before being exposed to the normal stimulus.

(3) Some dogs, even while "neurotic," react adequately if the friendly experimenter stays in the experimental room; some cats, if the friendly experimenter pets them or if another "normal" cat is present in the enclosure. This parallels the supportive effect of the relationship with the therapist on the human patient.

INSULIN AND ELECTROSHOCK TREATMENT

The presentation of psychosomatics would be incomplete without a description of insulin and electroshock treatment. The procedures are used mainly in the treatment of severe psychotic conditions, namely schizophrenia and depressive reactions of the manic-depressive or the involuntal type. In both of these conditions, there are relatively minor psychosomatic alterations, and the predominant symptomatology is in the psychological sphere. Briefly, in the schizophrenic reaction type, there is a flattening of the overt affectivity and a prevalence of bizarre reactions. Commonly four types are differentiated although the dividing line is not sharp and one form may change to the other.

(1) *Simple type:* There is a gradual deterioration and flattening of interest and affect and finally of intelligence. There are no hallucinations or delusions, but the patient engages in silly preoccupations and gives irrational explanations for his activity. (2) *Paranoid type:* There are ideas of reference and influence and delusions of persecution; auditory hallucinations, including obscene words, predominate. (3) *Catatonic type:* There is an alternation between lack of external interest, to the point of stupor and waxy-flexibility, and periods of excitement

and rage. The first type of manifestation covers a much longer period. (4) *Hebephrenic type*: There is an abundance of involved and bizarre ideas and theories, often of a philosophical nature, together with delusions and hallucinations.

In psychotic depression there is a sad mood, slowness of thought and speech, lack of drive or, in the agitated type, there is, together with the depression, anxiety and motor restlessness such as wringing of hands.

Psychodynamically in schizophrenia, the feeling of being unloved, with a resultant withdrawing of interest from the world (narcissism) and a secondary attempt to reach out towards the world and express forbidden impulses and alter reality, predominate. In depression, disappointment in the world with the resultant intense hostility and guilt and finally the hostility turning in on one's self are the sequence of events.

In electroshock treatment, convulsions are produced. The patient's clothes are loosened and he is strapped to the couch by means of a specially constructed jacket in order to prevent his being injured during the convulsion. In some cases, sodium amytal is given before the shock in order to relax the patient. Electrodes are then placed on the patient's forehead. A dose of from 70 to 110 volts is given, usually for a period of 0.35 seconds. The treatment is given only as often as is necessary to keep the patient in an improved condition and lasts until recovery. Thus there is a great deal of variation in length and frequency of treatment from patient to patient.

Insulin is a product of the pancreas which lowers the blood sugar, which, in turn, affects the brain cells. Insulin is administered to the patient intramuscularly, starting with twenty units and increasing the dosage each day until coma is produced. When the proper amount of insulin is given, coma appears about three hours after the injection. The coma is allowed to last for an hour and a half when it is terminated by a nasal feeding of sugared tea. Where it is desired to terminate the coma rapidly, or when the nasal feeding is ineffective, the patient is given an injection of glucose. If the coma is not terminated at the proper time, convulsions, which are undesirable, may result. (Sakel, 1935.)

The effectiveness of these treatments is illustrated by the following figures: Electroshock is

effective about 85 per cent in depressions, insulin about 59 per cent in schizophrenia. The recovery rate in schizophrenia is about twice that obtained by usual hospital care. The ideal procedure is if treatment is supplemented or followed by psychotherapy, but the treatment can be effective even without that. The manner in which the treatment is effective is not known. The following assumptions are prevalent:

(1) Insulin and electroshock alter the brain metabolism, causing changes in oxidation, and producing either anoxemia or hyperoxemia.

(2) They act as sedatives reducing the overactivity of the nervous system and reducing the emotional pressure behind the symptoms.

(3) They stimulate the vegetative regulative centers, particularly the sympathetic division.

(4) Some organic changes are produced, especially in convulsive therapy, which imitate frontal lobotomy, interrupting the paths from the cerebral cortex to the thalamus and reducing the transmission of emotional impulses from one to the other.

(5) They act predominantly as a form of psychotherapy because the patient is given more attention and is always nursed back into active existence from the helpless state of unconsciousness.

Whichever of these assumptions is right, the patient becomes more accessible to contact with the outside world, particularly with people who look after him.

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PSYCHOTHERAPY.—(Psychotherapy can be defined as the treatment of mental or physical disorder by using mental influences.)

Early Forms of Therapy. The origin of psychotherapy is ancient and shrouded in the obscurities of magic and miracle. The first physicians were the priest, the medicine man, the shaman, and their kind. Spells were cast, rites performed, incantations chanted, prayers said, and offerings made, to invoke the gods or the forces of nature so that health might be restored. Religion and healing were ever in close affinity. For example, in Egypt five thousand years before Christ, a princess was cured of demoniacal possession by the god Khons, according to a stone inscription. In Greece before the time of Hippocrates (d. 377 B.C.), who was the first Greek layman to become a professional physician, the medical centers were the temples of Aesculapius, god of medicine. There are descriptions of the elaborate procedures required of the sick before the oracle spoke in the inner temple: the bestowal of offerings, bathing in the fountains of the outer temple, and periods of probation devoted to public prayers and to listening to exhortations. In Europe in the Middle Ages treatment remained much the same, though religion had an altered nomenclature. Churches often had specialties. St. Roch, for instance, cured plague; St. Petronella, fevers; St. Mein, skin diseases. During this period a special power was attributed to kings in England and France, called "the king's touch," a curative for scrofula. Magic had by no means disappeared. Repeating the words "max, pax, et adimax" was believed to be the best remedy for hydrophobia; and "abracadabra" inscribed in a triangular pattern on an amulet worn by a patient with fever, was said to effect a cure promptly. Sir James Frazer in his classic *The Golden Bough* clarifies the distinction between magic and religion by pointing out that in religion man appeals to higher powers to intervene in his behalf, while in magical practices he tries to control the forces of nature directly. Some authorities see magic as an early attempt at true science. The medieval physician's prescriptions savor of magic, but at least he was endeavoring to utilize natural resources when he advised that a sow be tied to a fever patient's bed or that a wolf's right eye be ground up and applied to sore eyes.

Animal Magnetism. The doctrine of animal magnetism was a link between magical methods of treatment and scientific psychotherapy. Franz Anton Mesmer (1733-1815), a Viennese physician, is regarded as the founder of animal magnetism, though there were a number of other well-known magnetists, conspicuously William Maxwell, a Scottish physician. Mesmer described animal magnetism as a "universal fluid" but also as a kind of "impalpable gas." By means of this the planets could, he thought, influence man. He soon came to believe that the human will could set the fluid to work to cure disease, which he regarded as disharmony in the body. He supposed that the two sides of the body were opposite poles as in a magnet, and that to have health there must be a harmonious distribution of the fluid. Since he met with little encouragement in Germany or Switzerland, he went to Paris in 1778. Here he developed a unique clinic which was extraordinarily popular. The numerous patients were ushered into a darkened hall to the accompaniment of soft music. They then gathered around a low but expansive oaken tub, the famous *baquet*, which served as a storage battery for magnetism. The tub contained iron filings, bottles arranged symmetrically, and ground glass, all immersed in water. Jointed iron rods projected through the lid, and the patients applied the free ends to ailing parts of their bodies. The effects thus obtained were soon augmented by the presence of Mesmer himself, garbed in a silken robe and in his hand a long iron wand. Complete silence was enjoined as he moved slowly among the patients, fixing his eyes upon them, passing his hands over their bodies, and touching them with the iron wand. This treatment was likely to result in an ecstatic or convulsive "crisis," believed to be most beneficial. Many persons suffering from widely varied complaints were sure they were cured after two or three treatments. But Mesmer's remarkable success was finally impeded by two investigating commissions which discovered nothing more than "imagination" and "imitation" in magnetism. The consequent unfavorable reports, along with newspaper ridicule, turned popular opinion against him.

Magnetism, or mesmerism as it was often called, entered into a second phase around 1787. The beginning of this period is most often associated with the name of the Marquis de Puység-

gur, a disciple of Mesmer. Puységur was the first to take note of the trance. One time in endeavoring to magnetize a young shepherd, Puységur found that, instead of the mesmeric crisis, he had induced a sleep-like state in which the subject was highly suggestible. This condition was given the name "somnambulism." Workers in the field of magnetism now became convinced that their chief aim should be to produce somnambulists who were "lucid" or "ultralucid," i.e., who had the exalted, clairvoyant powers attributed to the state. Lucid somnambulists were called upon to treat the sick through supposedly superior understanding. The prescriptions were often fantastic, for example, one somnambulist repeatedly ordered a powder made from the callosities of horses legs. Between 1813 and 1840 animal magnetism flourished exuberantly. Noted physicians and physiologists subscribed to the doctrine. There was much written about it, and numerous societies were formed for its promotion. Eventually the downfall of magnetism came through its inherent absurdities.

Hypnotism and Suggestion. Belief in animal magnetism gradually gave way to a more intelligent understanding of the facts. In France, during the second decade of the nineteenth century, the Abbé Faria showed by experiment that the real cause of the mesmeric trance lay within the hypnotized person himself. General Noizet, one of the Abbé's subjects was convinced that this was true and passed on the idea to a friend of his, Alexandre Bertrand, who is credited by some with being the founder of the theory of suggestion. However, Bertrand did not attract as much attention in this regard as did James Braid, an English physician. In 1841, the latter first investigated the trance and decided eventually that it was not due to any mysterious magnetic fluid. He coined the word "hypnotism" (from the Greek word *hypnos*, meaning sleep), and was probably the first to use the term "suggestion." Hypnotism attained fame especially as a means of achieving painless surgery. Esdaile, an English surgeon practicing in India, was a particularly noteworthy exponent of the method. He used the trance successfully in performing over a thousand operations, some three hundred of which were major ones. But the discovery of chloroform and ether around the middle of the century caused the eclipse of the hypnotic method,

since chemical anesthetics could be more readily employed. Hypnotism fell into disrepute and for about twenty years—between 1850 and 1870—was largely in the hands of charlatans.

The later development of hypnotism began with a controversy between two French schools of thought, one led by Liébeault and Bernheim in the little town of Nancy in eastern France and the other by Charcot in Paris. In 1864 Liébeault began to practice medicine in Nancy and with his peasant clientele often used hypnotism. He wrote a remarkable book on the subject. But little notice was paid to this until twenty years later when Bernheim, a professor in the local medical school, himself published an excellent work in which he called attention to Liébeault's contribution. They both found suggestion to be the essence of hypnotism. To them suggestion meant the immediate and uncritical acceptance of an idea in terms of action or belief. About 1880 Charcot, a distinguished Parisian neurologist, independently undertook to revive hypnotism and to study it carefully. In his zeal to be scientific he saw hypnosis (the trance state) only as a physiological phenomenon associated with hysteria. His experiments had serious errors, and he studied a very limited number of subjects, mainly three hysterical young women. He did not himself hypnotize but depended on his assistants to do this in preparation for his demonstrations. Because of his great reputation, his faulty conclusions were accepted for a time. But the point of view of the Nancy school eventually came to be accepted by scientific workers, even Charcot himself. After Charcot's death in 1893 Pierre Janet became the outstanding figure in French psychotherapy.

The work of the French in hypnotism had far-reaching influence. Many authorities in other parts of Europe and the rest of the world now gave serious attention to the subject and much was written on it. The period between 1888 and 1896 was one of very great activity along the line of suggestive therapeutics. All kinds of disorders were treated by hypnotic or waking suggestion; it was used not only as a curative for psychoneuroses and other more serious mental disturbances but also to mitigate the effects of organic lesions. Among the numerous writers in the field were: Forel in Switzerland; Moll in Germany; Van Eeden in Holland; Wetterstrand in Sweden; Bianchi in

Italy; Caryophyllis in Greece; Bechterew in Russia; and Moraga in South America. English-speaking countries were slower in adopting this type of therapy. However, Bramwell in England began in 1896 to publish accounts of his notable work. In the United States the investigations of G. Stanley Hall were followed at a later time by those of Boris Sidis and Morton Prince. But hypnotism had fallen into another decline. It was being criticized as producing only automatic response, and as difficult to use, even immoral.

About 1915 Janet in France predicted that hypnotism would be revived again. P. C. Young in the United States remarks on the truth of this prophecy in reviewing the literature on hypnotism in the *Psychological Bulletin* for May, 1931. He says further: "So many articles have been published [between January, 1926, and July, 1930], especially in German, that it will be impossible even to refer to them by title. . . . The reviewer has notes on 66 different books and 233 separate articles dealing entirely or clearly with hypnosis and suggestion. Of this number the Germans, Austrians, and Dutch are responsible for 15 books and 112 articles; the Americans for 17 books (including several texts on abnormal psychology) and 60 articles; the English for 16 books and 22 articles; the Russians and Poles for 5 books and 12 articles; the rest being scattered." In the February, 1941, issue of the *Psychological Bulletin* Young again reports on hypnotism, covering the nine-year period ending in 1939; he refers to "350 or so books and articles published during that time" on the subject.

In the thirty years since 1915 there has been careful and critical evaluation of hypnotism as well as its practical use. The American approach has differed from the European. In the United States the psychological laboratories have contributed numerous experimental studies and the literature has emphasized theory and explanation; in Europe interest has largely centered on application in medical clinics and investigation in physiological laboratories. The medical profession in the United States has been singularly indifferent to hypnotism, an attitude encouraged by popular prejudice. In Europe, on the other hand, medical publications and societies, especially those of Germany, have given full attention to this type of therapy. Its uses have been varied. It has been successfully em-

ployed as a means of diagnosis, especially to distinguish functional from organic disease; and as a method of treatment for (1) maladies which may have psychic components or origin, such as asthma, indigestion, and dermatological disturbances like warts and eczema; (2) certain mental disorders, including amnesia and many kinds of psychoneuroses; and (3) undesirable habits, for example, alcoholism, sex perversion, stuttering, etc. The European use of the trance to allay the pains of childbirth is especially noteworthy. Hypnotism has also proved valuable in operations in reducing the amount of anesthetic needed and as a general aid before and after surgery. It is too soon to say how much or how effectively the hypnotic method has been employed for war neuroses in the Second World War; but Eder, an English physician writing in regard to results with hypnotically treated patients during the First World War, states that "91.5 per cent of cases of war shock were cured by this method and 8.5 per cent improved." It must be remembered, however, that not every one is hypnotizable or easily hypnotized.

American psychologists have subjected the well-known phenomena of hypnotism to close scrutiny and rigorous experimental test. This field of investigation has attracted the attention of many able scientists, among the number C. L. Hull, P. C. Young, M. H. Erickson, A. F. Jenness, F. A. Pattie, and others. In his comprehensive book, *Hypnosis and Suggestibility*, Hull gives experimental findings on post-hypnotic suggestion and amnesia, improved memory, resistance to pain and fatigue, and other abilities reportedly superior during the trance. The majority of authorities hold to the idea that hypnosis is a manifestation of extreme suggestibility. That there exists a dissociation in Janet's sense of profound separation, is questioned. No informed student of the subject believes any longer that the hypnotist has any power over the subject other than through suggestion. Even *rapport*, the much-discussed accord between the hypnotized person and the hypnotist, turns out not to be an essential factor. Hull and others relate suggestion to learning, i.e., established association of words with the appropriate response produces subsequent reaction of theideo-motor type. Most of the American experimental work has only indirect bearing on therapeutic usage but some relevant

conclusions emerge. For example, it becomes clear from the studies of Kellogg and Patten that suggestions given to take effect post-hypnotically need to be repeated at sufficient intervals unless there are inevitable practice effects. R. R. Sears finds that hypnotically suggested anesthesia results in the disappearance of the obvious manifestations of pain, i.e., those under voluntary control, such as outcries and facial distortion, and semi-voluntary ones like altered respiration; but that pulse-rate is only reduced by a half to three quarters and the galvanic skin reaction by about 20 per cent. Even so, the use of hypnotism as an anesthetic is fully justified. More striking evidence of physiological changes of an involuntary sort comes from the study of brain potentials by Loomis, Harvey, and Hobart. With the subject's eyes fastened open by adhesive tape, these investigators suggested to him alternately—at 15 second intervals—that he could see and that he was blind. The suggestions of blindness always produced the typical "trains" that attend absence of vision. In the light of carefully controlled experiments like these, it is difficult to justify the contention of Pattie, Dorcus, and some others that a hypnotized person is merely acting or malingering.

Some of the reports from Europe regarding the physiological effects of hypnotic suggestion are indeed astonishing. Povorinskij and Finne caused blood sugar to increase by suggesting to the subject that he was eating honey; Shliffer counteracted the effects of adrenalin through suggestion; Platonow and Matskevich plied their subjects with enough alcohol to cause intoxication, but prevented it through suggestions that water was being drunk; Heilig and Hoff suggested liking or dislike for food and aroused appropriate stomach acidity as a consequence; Langheinrich suggested that his subjects were ingesting variously butter or bouillon and found congruous secretions when contents of the duodenum were examined; Marx as well as Heilig and Hoff were able to bring about changes in quantity and quality of urine secreted. Though not all investigators abroad or in this country get similar results, it is hard to avoid the conclusion that suggestion can markedly effect the autonomic nervous system. It also appears to be true that the specific suggestions must be in a form consistent with past associations of the subject; hence the utility of indirect suggestion. The successful experimenter

does not suggest suitable acidity of gastric secretion, but rather that the subject is eating a much-liked food, because in times past he has eaten this food with great relish and there has been the characteristic gastric secretion. In short, the words about eating the food have become conditioned stimuli, in Pavlov's sense, for certain physiological reactions. Many of the criticisms of experiments on hypnotized subjects are directed toward the absence of a control situation in which the same suggestions are given during a non-trance state. There are, however, actual experiments by Luckhardt and Johnston in which merely talking to an un-hypnotized person about food caused a rise in acidity and volume of digestive secretions similar to the effects of hypnotic hallucinations. Evidently suggestive effects are not limited to the trance.

The many variations and contradictions in the findings of experimenters in hypnotism deserve consideration. It is possible that the controls are at times inadequate. It is very certain that hypnotism is a far more complex matter than was first believed. Suggestions offered may not be properly understood by the subject, or unintentional suggestions which seriously alter results, may easily be conveyed. There not only appear to be different stages and kinds of hypnosis but many complicating factors, such as differences in personality, attitudes, and expectations on the part of the subject, and variations in method of induction on the part of the hypnotist. P. C. Young writing on hypnosis in 1941 says, "It seems a much more powerful reaction, much more potentially dangerous, and much more useful experimentally and therapeutically than was thought 10 years ago."

Autohypnotism, or self-hypnotism, is a variant that has attained some popularity recently in the eastern United States through the work of Andrew Salter of New York City. Ordinary non-trance suggestion and autosuggestion have been earnestly advocated, especially from about 1910 to 1920 by Coué and Baudouin in France. Their influence spread to other countries including the United States. In Europe especially up to the time of the Second World War this type of therapy attracted the active interest of a good many scientific experimenters and practicing physicians. Doctors everywhere make use of suggestion at times in authoritative commands, persuasive suggestions, impressive treat-

ment, placebos, or some other form. In general it can be said that ordinary suggestion has some advantages over hypnotic suggestion, but that statement also holds true in reverse.

Modern Religious Cures. Religion has never lost its effectiveness as a cure. Outstanding among modern European shrines is the miraculous spring at Lourdes in France. Since 1868 multitudes have gone there for relief from their ailments and many have departed cured. In eastern Canada at St. Anne de Beaupré, with its sacred finger bone of St. Anne, similar cures are obtained. Nor are these shrines isolated examples of present-day religious means to healing. It is quite safe to say that all over the world religion in one form or another has therapeutic uses.

A striking example is Christian Science, promulgated by Mrs. Mary Baker Eddy. This doctrine is a direct descendant of animal magnetism, which had quickly spread from France to America. Phineas Quimby, a New Englander, became a successful magnetizer, and through his treatment Mrs. Mary Baker Glover—later to become Mrs. Eddy—was cured of an hysterical paralysis. The two became great friends and after his death in 1866 she took over his manuscripts, which became the basis for her *Science and Health with Key to the Scriptures*. Later she repudiated this origin and declared Quimby's influence over her to have been one of "malicious animal magnetism." Her book is, however, essentially Quimby's teaching though replete with added rhetorical embellishment. From a therapeutic standpoint the significant idea is the denial of matter, hence of sickness, which is described as "error." Mrs. Eddy states that "God is All-in-all," that "nothing is matter." The way to cure illness is simply to deny its existence, since it is only a figment of "mortal mind." The healer, known as the practitioner, does not need any knowledge of medicine, surgery, or hygiene; he has merely to make clear to the patient that the illness, no matter what its nature, does not exist. There is no necessity for prophylactic measures or attention to diet or physical hygiene. "Animal magnetism" is singled out for special condemnation by Mrs. Eddy.

Christian Science has attained enormous popularity, and has a truly impressive number of adherents, not only in the United States but abroad. One of its several periodical publica-

tions is translated into six foreign languages and also into Braille. The large "Mother Church" in Boston, established by Mrs. Eddy in 1895, has been greatly added to; and there are numerous branch churches not only throughout this country but abroad as well. Christian Science has the advantages of methods of suggestion and reassurance. The patient is kept from fear and worry with consequent physical disturbance, and his body is thus prepared for normal functioning through inherent restorative properties. All religious treatment, if accepted wholeheartedly by the patient, provides a salutary feeling of security based on belief that the forces of the universe are supporting him. Janet points out that Christian Science marks a distinct advance over miraculous cures in that the human mind is recognized as a force for good or ill.

There have been other religious healing movements having more or less in common with Christian Science. Probably the best known are New Thought and the Emmanuel Movement. New Thought arose around the middle of the nineteenth century, and stressed a metaphysical idealism which showed similarities to New England transcendentalism, and also to the philosophy of Plato and the Vedanta of India. The aim of New Thought was to conquer human ills by establishing harmony with the Divine. Some of its exponents rather closely followed Christian Science in their directions for healing, but the greater number left room for hygiene and surgery, and even necessary medication. The Emmanuel Movement was begun in 1906 by Elwood Worcester and Samuel McComb, rectors of the Emmanuel Episcopal Church of Boston, in collaboration with some physicians. They sought to combine religion and medicine in a sensible eclectic therapy. Only functional disorders and bad habits, such as alcoholism, were treated. The movement spread to other churches and to other states and foreign countries. At the present time, however, New Thought and the Emmanuel Movement have been largely supplanted by less well known expressions of similar ideas, for example one doctrine called "Unity."

Allusion should be made to a very successful application of religion designated as the Fellowship of Alcoholics Anonymous, which has branches in many cities all over the United

States. It is an organization of reformed alcoholics, both men and women, who individually visit drunkards and persuade them to join. The fundamental tenet is the belief that God, as understood by each person, will supply the necessary strength for reform, if the need is admitted fully, restitution made to wronged persons, and a new way of life attempted. Members of Alcoholics Anonymous meet weekly and report their own experiences in a kind of public confession; they also have social meetings.

Psychoanalysis. Many psychiatrists believe psychoanalysis to be the one outstanding therapeutic method. Sigmund Freud (1856-1939) was the founder of the movement. He was born in Czechoslovakia of Jewish parentage, but spent most of his life in Vienna. As a medical student he became especially interested in neurology and later even studied with the great Charcot in Paris for a while. Freud was impressed by the use of hypnotism in the treatment of hysteria but not entirely satisfied with that method. With Josef Breuer, a Viennese physician, he began to combine hypnotism with "mental catharsis," a procedure in which the neurotic patient "talked out" his troubles and so found relief. Finally Freud abandoned hypnotism in favor of the catharsis method alone. The patient was asked to assume a reclining position, relax, and tell whatever came into his mind about himself and his troubles. If he stopped in his recountal, he was pressed to continue. Eventually free association came to be controlled somewhat by Freud's insistence that the associations concern the past, especially early childhood events. Dreams were also reported and served as a basis for further associations on the part of the patient but primarily as a fountainhead of information for Freud. In all this material he sought the complex, or disturbing idea, which he believed to be the cause of the patient's trouble. The true source had to be recognized and the early experience revived emotionally by the patient to effect a cure, and he was helped toward this by Freud's interpretation. Freud's book *The Interpretation of Dreams* was published in German in 1900. This was followed in 1904 by another of his earlier works, *Psychopathology in Everyday Life*, in which slips of tongue, pen, and memory, and all kinds of lapses were analyzed and shown to be indicative of complexes and a

kind of forgetting Freud explained as due to unconscious motivation.

By this time psychoanalysis had become not simply a method of treatment for neuroses, but an elaborate theory which its creator was continually expanding. The foundation is his belief in a subconscious mind, called by him "the Unconscious," which is far more important than the conscious mind. The theory of a subconscious mind is not original with Freud, but he added greatly to the then current concepts and gave special names and functions to subdivisions, such as the "Id," the mass of primitive impulses striving blindly for gratification, and the "Foreconscious," or "Preconscious," the part containing ideas which may be attended to. The keystone of his teachings is the importance of motivation through persisting desires repressed into the unconscious. He not only holds that all behavior is motivated by desires, but that nearly all of these are of a sexual nature. His followers claim that he uses the term "sex" in a very broad sense; Freud himself denies any indirectness of meaning. His main thesis in respect to therapeutics hinges on the dominance of sex and can be summed up in the postulate that neuroses have their beginning in repressed childhood sexuality. Such repression is also supposed to be normal with non-neurotic persons. According to Freud, all infants show sexuality in a "narcissism," or self-love, which finds gratification in various allegedly pleasurable experiences such as sucking, urinating, defecating, etc. In early childhood the "libido," or sex urge, comes to be directed toward the parent of the opposite sex, and the other parent is the object of murderous wishes. This is the general picture, but it is subject to modification by the child's tendency to identify himself with either parent. If normal development out of these early stages does not occur, then "fixations," "regressions," "infantilisms," or "the Oedipus complex" expressed in various neurotic symptoms, may result in later years. Freud conceives repressed desires as dramatically active. Childhood wishes live on in the unconscious as dynamic entities generating conflict. They constantly betray their presence in seemingly irrelevant acts as well as in dreams and in many other ways. It is in dreams that repressed desires can so easily break loose from the restraining force of "the Censor," the name Freud gives to our moral and social standards. Since

the desires are afraid of the Censor, they assume disguises and appear in symbolic form. Freud's writing is embellished with frequent personification, terms borrowed from Greek mythology, speculative interpretation akin to Hegelian dialectic, and numerous dichotomies, such as the libido and the ego, the ego and the id, the pleasure principle and the reality principle, the life instinct and the death instinct. This brief survey can only suggest faintly the richness of psychoanalysis, which Freud developed, remodeled, and wrote about constantly up to the time of his death.

It is not always easy to separate the facts basic to Freud's therapy from his theoretical assumptions. Take, for instance, two pillars of the therapy, resistance and transference. He believes that the early emotional experiences which cause complexes are deliberately repressed by the unconscious mind, and that to get relief the patient must relive them at the conscious level. "Resistance" is said to occur when the patient in the course of the psychoanalysis is unable or unwilling to tell everything concerning the disturbing situation. That this impasse is often reached is a well-known fact to therapists. But it is shifting from fact to theory to suppose, as does Freud, that an unconscious mind actively resists the memories and deliberately suppresses them. The American psychologist R. S. Woodworth points out that it is in keeping with our knowledge of memory and association to offer an explanation in terms of inadequacies of the association mechanism. As regards what Freud calls "transference," there is again a certain factual patient-doctor relationship to be accounted for. The patient often shows great admiration or love, or at times definite hate, for the analyst in the course of the treatment. Such reactions had disturbed and baffled Freud's earlier co-worker, Dr. Breuer. Freud, however, with his ever-ready genius for interpretation, regarded them as significant and useful. The emotion, according to him, is revived without a full renaissance of the whole childhood situation, therefore the emotion will center on the analyst as a substitute for the original person—probably the parent—who figured in the episode. The transference of attitude is believed to be a good thing temporarily, until the patient is able to carry on independently of the analyst. All this makes a very interesting theoretical

explanation, but there is no conclusive evidence that such transfer of emotional attitude actually takes place. The present emotion and the original one may not be one and the same. It is apparent that Freud fails to keep fact and interpretation separate.

In evaluating the general theory of psychoanalysis the more critically minded object to the hypothetical doctrine of the unconscious and the concept of ideas living on as ideas; to over-emphasis on sex, especially the supposition of infant sexuality; and to the many unproved assumptions and imaginative interpretations. It is contended that Freud made assertions for which there is wholly inadequate evidence. But he is highly commended, particularly by psychiatrists, for the invigorating freshness of his approach, his penetrating exploration of human motives, his emphasis on the importance of childhood in personality formation, and his psychogenic explanations introduced at a time when medicine was purely somatic and psychology had nothing to offer the troubled mind. Probably Freud is best regarded as an outstanding pioneer who recognized important aspects of psychotherapy but whose novel theories must inevitably be revised and amended.

From the standpoint of therapy, psychoanalysis offers the benefits of confessional methods in general. There is universal agreement on the wisdom of encouraging many disturbed patients to unburden themselves in this way. The "talking-out" method has a high place as a remedy and is used in some form by the great majority of psychotherapists. The most significant objection to Freudian analysis is that it does not go far enough, is a self-examination without sufficient constructiveness and upbuilding. There are other questionable aspects as well. It is doubtful whether incessant reminiscence in search of juvenile sex experience is wholesome or inspiring. Constant dwelling on one's self in the long process of psychoanalysis may develop or increase morbid egoism in the already self-centered neurotic. Freud's one notably constructive recommendation, viz., sublimation, or worthy substitute satisfaction for the libido, is allotted little emphasis in comparison with that given to explorations into the past. It has been pointed out that extreme attention to the past with little or no planning for the future may be a very unproductive pro-

cedure. Critics express grave doubt as to whether the interpretations given by the psychoanalysts are always valid. Analysts do not agree among themselves. The critics also give definite evidence that patients may sometimes be harmed by psychoanalysis or fail to get over their difficulties. Satisfactory results, it is said, may be due primarily to suggestion conveyed by the analyst in his impressive language, reassuring manner, etc. On the other hand psychoanalytic theory and practice are in many quarters accepted almost like a religious faith, arousing fervent enthusiasm and profound belief in their value. Psychoanalysts point to their successes and are convinced that their method is without question the best type of psychotherapy. They believe that psychoanalysis is much more than catharsis, is a "depth psychology" which uncovers the unconscious, explores the innermost recesses of the personality, and produces insight as a consequence of Freudian interpretation.

A favorable attitude toward psychoanalysis did not develop immediately. It was not until after 1900 that Freud had many followers. However, by 1911 psychoanalysis was well established. It has spread to various parts of the world, but has attained a more prominent place in the United States and Great Britain than elsewhere. Paul Schilder, a Viennese who later settled in New York, was the first to attempt a formulation of psychoanalytic psychiatry. The American physicians Jelliffe and William Alanson White became early proponents of this type of medical practice. Freud himself visited the United States in 1909 and gave a course of lectures at Clark University. But the person who has been more responsible than any one else for the diffusion of psychoanalysis in the United States is A. A. Brill, one of Freud's first pupils. Brill has translated most of Freud's work, and in 1911 founded the New York Psychoanalytical Society. In England Ernest Jones was one of the first to promulgate the new doctrine; Rivers was another of its earlier British advocates. American psychologists, with their dominant interest in experimental psychology, have not as a group shown the enthusiasm of the psychiatrists for psychoanalysis; English psychologists have given it a somewhat more cordial reception. At the present time psychoanalysis unquestionably has an outstanding position in medical psychotherapy. There are now a considerable number of jour-

nals devoted to psychoanalysis, an International Psychoanalytic Society with its own press, and, up to the time of the Second World War, active psychoanalytical societies in all the chief civilized countries. The literature of the movement is vast. Among those who have made distinctive supplementary clinical observations and expansions in theory are Abraham, Ferenszi, Rank, Ernest Jones, Alexander, Reik, Karen Horney, and Helene Deutsch. Abraham, Ferenszi, and Jones have made significant original contributions along the line of psychosexual genesis. Freud's theoretical investigations took him into many fields including history, literature, sociology, anthropology, religion, and art; and some of his disciples have undertaken similar excursions. For instance, Reik has interpreted psychoanalytically Goethe's romance with Friederika; and Abraham has made a detailed psychoanalytic study of the Egyptian King Amenhotep IV, whose reign around 3300 B.C. was shadowed by what we would now call his paranoid delusions. Otto Rank has introduced the concept of "the trauma of birth," i.e., the shock suffered by the infant when born. This experience is believed by Rank to be the greatest human frustration, though Freud himself does not attach as much importance to it. Two women psychologists, Helene Deutsch and Karen Horney, have presented their ideas as to the development of female sexuality, which are somewhat at variance with Freud's.

Horney has also disputed other and more basic Freudian hypotheses. She thinks that the patient's problems are to be explained more in terms of current attitudes in society and less in respect to childhood. According to her, sociological influences are really the most important source of unconscious conflict. Psychopathology, then, hinges on the helplessness, distress, hostility, and especially fear, thus engendered. She calls this emotional condition "basic anxiety." Because of feeling helpless, the individual is rendered less efficient, and because he is less efficient, he feels helpless; hence the "vicious circle," which Horney believes to be one of the most important elements in the persistence of pathological manifestations. Kardiner has a point of view similar in many respects. Part of the remedy, according to these analysts, should consist in changing the social order fundamentally. Freud, however, does not believe that man's aggressiveness can be altered

sufficiently to make possible a complete reconstruction of society. It should be noted that the general therapeutic procedure is the same in both approaches, though naturally the interpretations of the analyst are in terms of his particular point of view. The theories of Horney and Kardiner—particularly as expressed by the former in her books—have attracted a good deal of attention. Such variations in psychoanalytic concepts are an encouraging indication that psychoanalysis is not static, but has reached the wholesome stage when criticism is developing within the movement.

Psychoanalysis has practical limitations relative to time and cost. Statistics show that the average patient is treated an hour five or six days a week for from one to three years. At the usual charge of ten dollars a visit—the fee may be as much as twenty-five dollars—psychoanalysis in its usual form is clearly not for the poor. Certain other limitations are indicated by Maslow and Mittelman, strong advocates of psychoanalysis, who state: "The patient must have enough intelligence to realize that his suffering may have emotional causes, and to understand the analyst's explanations. Thus, feeble-minded people, for example, are not analyzable. The patient must have the 'right' type of psychological difficulty; in other words, not all types of psychological difficulties can be analyzed. Thus a patient with psychosis cannot be analyzed except in hospitals; and even here success is rather limited." The primary use of psychoanalysis is for the treatment of the milder mental disorders known as the psychoneuroses, or neuroses. The analytical procedure has, however, been used to a considerable extent in the study of those serious mental illnesses which we call functional psychoses. Moreover, Alexander, Dunbar, and Menninger have stressed the fact that there are psychogenic as well as somatogenic factors in organic disease; hence psychoanalysis can sometimes help an organic disorder. Mental aspects of many physical diseases have already been investigated from the psychoanalytic viewpoint, and detailed studies have been made of arterial hypertension, asthma, and some cardiac and endocrinological disorders. Mention should also be made of the intensive study of gastric neurosis by Franz Alexander, head of the Psychoanalytic Institute of Chicago. Naturally we cannot expect from psychoanalysis the startlingly immediate transformations of hypnotism

or religion, but analysts are convinced that their therapy is far more deep-reaching.

Outgrowths of Psychoanalysis. The two most widely known variants of psychoanalysis are Carl Jung's "analytical psychology" and Alfred Adler's "individual psychology," so named by their respective authors. Both Jung (b. 1875) and Adler (1870-1927) were early disciples of Freud, but in 1911 left his movement to develop their own theories. Jung, a Swiss whose activities have been carried on largely in Zurich, is usually considered the more profound of the two. In general therapeutic procedure they have a great deal in common with Freud, since all three use the "talking-out" method and study of dreams. There are marked divergences of theory, however.

In contrast to Freud, Jung lays no special emphasis on sex. For him, the libido is somewhat undifferentiated life-energy, which expresses itself in multitudinous ways, including food-getting, sex activities, and other instinctive reactions, and, more important still, distinctively human "creative strivings." The unconscious mind harbors not only repressed desires, but also inherited racial experience in the form of "primordial ideas," which constitute the psychic aspect of instinctive behavior. It may be noted that this racial, or collective, unconscious seems to be much like Freud's "Id." There are, however, distinct differences elsewhere in the views of the two men. Symbolism, for instance, is not the result of repression, according to Jung, but a natural manifestation of the survival of primitive thinking. The imagination is a limitless source of information as to personality, but fantasies concern the present life of the individual and the past of the race as well as repressed personal desires of childhood. In accounting for neuroses Jung finds the patient's present difficulty in adjusting to be the real cause, rather than the responses of early life, though these are predisposing causes. Jung begins therapy with a study of the way the patient has attacked his problem. Dreams are interpreted as betraying the attitude toward the difficulty. The aim of the analysis is to make clear to the patient his present primitive approach, to integrate the present and the past, and to redirect energy, especially unconscious energy, along worthy creative lines. Jung does not limit his "analytic psychology" to use solely with neurotics, but also employs the method

with normal individuals who have problems. We find much more that is constructive and inspiring in Jung's therapy than in that of Freud; in fact, the latter took exception to the moralizing of his former disciple. It must be admitted that the speculative theorizing in Jung's writings goes even further than Freud ventured, and has aroused among critics the accusation of mysticism in extreme. Jung's practical ability has been demonstrated, however, in his word-association test, a diagnostic device later standardized by Kent and Rosanoff. The test consists of a series of words, which are presented to the patient one at a time with the request that he respond by saying the first word he thinks of. Responses are carefully observed and various points noted, such as: the nature of the word given in reply; kind of repetition, if any; slowness, quickness, or unusualness of response; signs of emotion. Another contribution of Jung that pertains to diagnosis is his classification of human beings into types. While psychologists do not adhere to concepts of strict typal division, nevertheless Jung's terms "introvert" and "extrovert" have become well-established and useful descriptive terms. Jung has also made a brilliant study of the mental disorder at present generally known as schizophrenia. He has shown that there is meaning in the queer mental associations of patients suffering from this kind of insanity.

Adler, originally of Vienna, eventually developed his "individual psychology" in the United States. His essential point of difference with Freud lies in his conception of what constitutes the basic human drive. This Adler believes to be the ego motive, the desire to be important, to dominate, to have power. According to him, the human being primarily wants prestige, which is to be found in three chief fields: the social, the sexual, and the economic. The foundation of a neurosis is a feeling of inferiority. Adler makes much of "organ inferiority," i.e., physical defect or inadequacy, which he says arouses "the masculine protest." This drives the individual to "compensation." For example, Napoleon, with his organ inferiority of unusual shortness of stature, had inferiority feelings which led him to compensate through conquest of Europe. Compensation is obviously not limited to neurotics, and, from the standpoint of society, may take desirable or undesirable forms. Adler thinks that all children

develop inferiority feelings, just as Freud believes all have Oedipus complexes. Every person, Adler declares, evolves a "style of life," which is largely the result of his childhood relation with his family. Whether he was of rich or poor parents, the oldest or youngest in the family, a spoiled child, etc., are matters of importance in his future sexual, vocational, and other adjustments. The sex urge is not dominant, but has significant expression in accordance with the style of life adopted. Adler's therapeutic method is a modified form of psychoanalysis. Treatment begins with a study of the individual's style of life, which is sought first in his family situation of early years, then in his likes and dislikes, vocational aims and activities, reading interests, even in his posture when awake or asleep, and in all possible indicators. Like Freud, Adler studied the patient's dreams; but these are regarded as symbolizing his attitudes toward the future and not as expressing past desires now preserved in the unconscious mind. There is, in fact, no place in Adlerian psychology for a distinction between the conscious and the unconscious; the two are conceived as bound together. Resistance is recognized by Adler, but said to be due to the patient's dread of being cured lest his undertakings afterwards should bring failure. The neurotic is described as faced with the problem of evading reality and of finding difficulties in his own path, so that he himself and those around him will allow him a life of special privilege. The objective in therapy is recognition of the true situation, of the inferiority complex and compensatory efforts, with a view to improving the style of life, which, though thoroughly delineated in childhood, is subject to some modification. Adler's theory and methods have attracted many; but critics, particularly Freudian psychoanalysts, find "individual psychology" superficial. However, the practical wisdom in some of the concepts—like the "inferiority complex," for instance—has left an unmistakable impress on psychotherapy.

Two other of Freud's early followers, Otto Rank (b. 1884), mentioned before, and Wilhelm Stekel (1868-1940), should be referred to here. They are psychoanalytical in general procedure but definitely depart from orthodox Freudianism in theory. Stekel separated from the original movement at about the same time as did Jung and Adler. Stekel's work is rather eclectic, for

he accepts essential points from Jung, Adler, and others. However, he has produced original contributions as well. His book on the interpretation of dream symbolism is an example, and though Freud did not approve of all the meanings found, he regarded many as satisfactory. Rank's early concepts concerning birth trauma have been so greatly supplemented by new theories that he cannot now be classed as a Freudian psychoanalyst. He emphasizes the importance of the patient's response to the immediate situation, the need to live in the present. He does not look upon the individual as at the mercy of his primitive instincts to the same extent as does Freud. The human being, Rank holds, is a creature notably capable of independence and self-activity.

The influence of psychoanalysis is also evidenced in the development of certain allied techniques. An important one of these is the psychodrama of Joseph Moreno (b. 1892), a Viennese psychoanalyst who has established the Psychodramatic Institute at Beacon, New York. Much of Moreno's theory and interpretation is Freudian, but he has made additions in concept and terminology. His therapeutic procedure is distinctive, for he keeps to the original Greek principle of emotional catharsis through dramatic performance. The patient obtains relief by acting out his trouble. At the Psychodramatic Institute, Moreno has a small theater, the stage consisting of three concentric platforms slightly raised one above the other to form broad steps, which, along with a balcony at the back, afford ample acting area. Some member of the staff as a rule serves as planner and director of the performances, which are always structured on the patient's problem. The director generally provides the central idea, but characterization, dialogue, and action are left to the patient himself. He is a "spontaneity player," that is, he plays the part exactly as he wishes. He may also choose the other players from members of the staff or patients present. All patients may comment and make suggestions freely. Moreno has used the technique with certain psychotic cases taken individually, but much more often in the form of group therapy with psychoneurotics, problem children, and adults experiencing difficult life situations. There are at present two other well-known psychodramatic theaters: one at Bellevue Hospital in New York City; the other at St.

Elizabeth's Hospital in Washington, D. C. The latter institution is treating war neuroses by means of the psychodrama and reports striking success.

Other psychoanalytically grounded forms of group and individual therapy have emerged. For example, Paul Schilder (1886-1940) at Bellevue Hospital used to have groups of six or seven adults meet about once a week for discussion—with his guidance and supplementation—of the autobiography of a member of the group. Schilder has recorded that this brings many benefits for the patient, including lessened feeling of social isolation and greater self-revelation because of the stimulating presence of others with similar difficulties. Results are described as especially good in social and obsessional neuroses. Group therapy has been successfully used by other well-qualified persons in this country, prominent among whom are K. Lewin and F. Redl. A very recent report by D. A. Shaskan and Miriam Jolesch gives a promising picture of a trial of group therapy with war neurotics. S. R. Slavson uses group therapy with maladjusted children in New York City. D. M. Levy, also of New York, has developed a method of "release therapy" with children taken individually. Both Slavson and Levy depend almost entirely on catharsis effects. Interpretation by the therapist is altogether absent or at a minimum. The child is given play materials with which to do as he pleases. The therapist observes all the child does, but offers little or no interference even though behavior is destructive or offensive. In one technique devised to deal with sibling rivalry Levy provides metal dolls which can be dismembered. In such play situations children who are "rejected," "frustrated," or otherwise disturbed, are enabled to release pent-up emotion fully and thus recover affective balance. Levy finds that relatively few sessions are necessary if (1) the child's problem has been of short duration, (2) if the cause is no longer active, and (3) if the difficulty was the result of a specific cause, such as a particular fear situation. It should be noted that play techniques have both a diagnostic and therapeutic value, and have been as successful with groups as with individuals. While doll play and clay modeling are the most common forms of release therapy for children, there are also a number of other media of expression, such as drawing, "finger painting,"

soap carving, imaginative literary composition, poetry, puppet play, and dancing. Howard Potter and Louise Despert at the Psychiatric Institute in New York City have maladjusted children express themselves in retelling folk tales or other stories. Slavson describes another utilization of the release method in the form of semi-social group meetings of underprivileged mothers, the ultimate objective being to help the children through their mothers. All these forms of therapy rest on a background of Freudian interpretation.

Carl Rogers, an American psychologist, has recently formulated a variety of individual therapy, the counseling interview, which is a further derivative of psychoanalysis. Although his procedure is again essentially catharsis, it deviates in foundation from the analysis of Freud to a greater extent than any of the preceding variants. Rogers allies himself more with Otto Rank and Karen Horney. The present rather than the past is stressed. In Rogers' writings sex has no special prominence, and the unconscious is disregarded. When discussing the clinical treatment of children he shows the attitude of the psychologist rather than the psychiatrist. He says of orthodox psychoanalysis, "... the interpretation is not usually made on the simplest basis which will explain the facts but is made in terms of a preconceived ideology, frequently unverified, sometimes fantastic. . . . Psychoanalysis makes the belief of a particular school of thought the *sine qua non* of interpretation. . . . Where child analysis traces a behavior difficulty back to a definitely conditioning experience, it appears to be on more valid ground." In *Counseling and Psychotherapy* (the terms are used interchangeably) Rogers gives a clear account of his "nondirective" counseling technique as it is used for adults and adolescents. The client is encouraged to free and full expression of his feelings, emotions, and attitudes in regard to his problem. The counselor must not intrude his own views; simply accept, recognize, and clarify, at appropriate moments, what the client is expressing. This procedure "frees the client to look clearly at himself and his problems" so that "positive impulses which make for growth" follow inevitably, according to Rogers. Eventually there will be insight, acceptance of the self, and increasingly integrated positive action. It is important that the counselor avoid giving advice, for it

is to be a "client-centered" therapy and not "the counselor-knows-best" type of assistance; he must listen especially for feeling, rather than focus attention on content.

Rogers regards his method as a form of the "relationship therapy" earlier developed by Frederick Allen (at the Philadelphia Child Guidance Clinic), Jessie Taft, and others. "Relationship therapy" is so called because the relationship between the child or parent and the therapist is the prime feature. Rogers further explains it by saying that Freudian analysis emphasizes two factors, (1) insight through interpretation and (2) emotional experience, giving the first element a somewhat more important place; relationship therapy, on the other hand, makes the emotional aspect pre-eminent. It is of paramount importance in the latter method that the individual be allowed full freedom to express his feelings and to arrive at an understanding and acceptance of himself and his emotional attitudes in terms of present reality. Such realization, it is believed, will necessarily result in personality growth. Rogers admits that this kind of therapy relies heavily on the individual's capacity for growth and adjustment. Nevertheless he is convinced that his method is adapted to clinical, educational, industrial, and even military needs. Certainly he has performed a valuable service in presenting a concise, well-defined formulation of procedure, illustrated in a novel way by a complete phonographically recorded case history covering eight one-hour interviews.

Brief reference should be made to "hypnoanalysis," or "hypnalysis," a combination of hypnotism and psychoanalysis. Attention has already been called to the fact that Freud and Breuer were the first to use the two procedures together. This form of therapy is not extensively employed but has some authoritative supporters, such as Milton Erickson, psychiatrist at Eloise Hospital, Michigan, and the Menninger Clinic in Topeka, Kansas. R. M. Lindner, psychologist, has just written a book entitled *Rebel Without a Cause*, in which he gives a complete transcript of a forty-six-hour analysis of a young criminal at the Lewisburg (Pennsylvania) Penitentiary. After thirty-two psychoanalytic sessions Lindner hypnotized his subject in order to recover lost memories of infancy. Certain frightening circumstances were disclosed, and this information was used by Lindner as a guide in

subsequent waking analysis. He believes that hypnoanalysis is valuable especially because it takes less time than psychoanalysis alone.

Other Forms of Psychotherapy. At the beginning of the present century Paul Dubois (1848-1918) in Switzerland began to attract attention through his method of treating neurotics by means of a kind of moralizing appeal to reason, often referred to as persuasion or moralization. The patient is ordered to bed in a sanatorium and put on a milk diet as well for a week, though these measures are only preliminaries to the real treatment, namely, personal talks by the doctor. In these conversations the latter explains the functional nature of the ailment and the importance of changed attitudes and more uplifting thoughts, the aim being to develop self-mastery founded on an improved philosophy of life. Moral persuasion has been quite widely practiced by physicians in many countries, including the United States. Janet points out that the procedure is related to New Thought and the Emmanuel Movement. He believes that Dubois' method actually consists of more than reasoning, that there is a constellation of curative auxiliaries, including change of scene, rest, discipline, heightened self-esteem, suggestion, and the physician's prestige and example. A form of therapy having points in common with Dubois' method is that of German-born Fritz Kunkel, who is now established in the United States. His interviews with patients are also constructive and challenging, but the emphasis is on a religious altruism: religious "illumination" through self-examination is to lead to social consciousness.

Pierre Janet (b. 1859), already referred to several times, built his own concepts of psychotherapy on a prodigious knowledge of the whole field. His greatest contribution is in the sphere of the psychoneuroses, which he reclassified into hysteria and psychasthenia. He believes that psychoneurotic conditions are due to lowered mental tension. Normally a psychological synthesis exists, according to him, but this is broken when the individual loses mental energy, or "psychological force," because of disease, fatigue, emotion, or pubertal changes. In psychasthenia there is a generalized lowering of tension, hence a state of psychological depression. In hysteria the lessening of tension is localized, and the result is a dissociation, or disappearance of some specific function. Janet has always recognized

subconscious behavior, which he often considers under the head of "mental automatisms." In his vast clinical practice he has employed many methods, cleverly adapting procedure to the needs of the individual. The illustrious American William James was greatly attracted by Janet's work, and did much to bring it to the attention of psychologists in the United States. However, James' practical interests were not particularly in the pathological, but rather in helping normal persons toward more worthwhile living. In his famous essay *The Energies of Men* he asserts that human beings have much latent mental power which can be released through proper stimulation. Janet discusses at length "treatment by excitation," as he calls it, and lists numerous techniques for making dormant human resources available. Janet's success has been great, but his basic concepts have become overshadowed by the much more resplendent theories of Freud.

In the United States, Adolf Meyer (b. 1866) has long been referred to as the "dean of American psychiatry." He came to this country from Zurich in 1892, and held several important institutional positions before becoming professor of psychiatry at the Johns Hopkins University and director of the Henry Phipps Psychiatric Clinic of the Johns Hopkins Hospital, Baltimore. He retired from there in 1941 after thirty years of outstanding service. He has written comparatively little, but his influence and leadership in psychotherapeutics, the mental hygiene movement, and hospital organization have been very great. Many rate him as the greatest living psychiatrist. He constructed his "objective psychobiology" on an exceedingly broad framework of scientific and cultural knowledge, for his scholarly erudition encompassed the past and present developments of medicine and science in general and sociological and anthropological origins as well as the facts of medical procedure in hospitals for mental cases. With his students he insisted on an open-minded research attitude toward all methods, theories, and data, with freedom for drawing any justifiable conclusions. In application he has used whatever brings results. He believes that psychotherapy must be administered on the basis of an understanding of the reactions of the total personality—"therapy of the person," he sometimes terms it. There should be penetrating discernment of all the facts of the pa-

tient's life; then completely adequate remedial measures can be carried through.

Since Meyer's work was with psychotics in institutions, he was able to work out a reconstructive program which has set a high standard for other hospitals in the United States and abroad. After careful investigation and recording of the patient's life experiences, all physical aids of medication, hygiene, diet, massage, etc., are enlisted. The psychological aspect is equally stressed. Meyer has made an elaborate classification of psychopathological reactions and reaction types. Though his original terminology is formidable, his students have been inspired by his ideas; and in actual application his procedures are simple and sensible. Often the patient's psychosis rests on bad mental habits, Meyer believes, and retraining is in order. Hence the need for occupational, vocational, and recreational therapy, and other psychotherapeutic supplements of this kind. Meyer has described his procedure as "activity therapy." Psychoanalysis in the usual sense of the term is not employed, but the psychiatrist interviews each patient individually and makes use of all appropriate measures, such as discussion of the patient's life history, "talking-out," guidance, persuasion, reassurance, and desensitization, or the elimination of a problem by increasingly free discussion. The patients also often gain much from personal contacts with the games director, occupational therapist, physiotherapist, and others of the hospital personnel. Psychobiology has socializing as one of its major objectives, so provides opportunity for varied human relationships.

While Meyer has not subscribed to the extravagances of Freudianism, he believes that the procedure and more circumspect principles of psychoanalysis may sometimes throw light on the mental processes of the insane. Typically for Meyer, however, the avenue of approach is the conscious mind, rather than the unconscious. He has a program of treatment for psychotics, while Freud has a specific method for psychoneurotics. Where the latter would make an analysis, the former brings about a synthesis, a marshalling of all the patient's resources toward mental and physical health. Psychoanalysis and psychobiology rate as the two leading movements in psychotherapy today. From the standpoint of time, psychobiology is much more practicable since the average length of treatment is

six months, as against eighteen months for psychoanalysis. L. E. Hinsie states on the basis of figures from the Department of Mental Hygiene of New York State in 1934: "... the psychoanalyst treats five patients a year, while the psychobiologist is responsible for the care of about 176 in the same time." Though some efforts are being made to use shortened forms of psychoanalysis, it can rarely be used in any form as a curative for the major mental disorders. Hinsie says further: "... statistical reports lead to the impression that the percentage of improvements in the psychogenic patients treated under the psychobiological regime is approximately the same as that of a similar group treated by psychoanalysis."

Adjuncts to Psychotherapy. Adjuncts to psychotherapy, so much used by Adolf Meyer, need further comment. There are many procedures aside from drugs, surgery, and physiotherapy which have been used as aids toward achieving mental and physical health. The method of complete rest in bed began to be emphasized by Weir Mitchell in the United States in 1875, and subsequently had extensive vogue both here and in Europe. Reduction of activity instead of absolute rest, and suitable interpolation of rest periods have also had advocates. William James early recognized the psychological implications of muscular relaxation so earnestly recommended by Annie Payson Call in her widely read popular book; and Edmund Jacobson later developed a meticulous method of physical relaxation which he uses with psychoneurotic disorders. Isolation was employed by Philippe Pinel (1745-1826) in France as an important part of his famous reform in treatment of the insane. Charcot became an enthusiastic believer in isolation for hysterical persons. And in England the members of the Tuke family—William, Samuel, and Daniel—put the isolation method into practice in their York Retreat for the insane. Education and re-education, in the sense of training to improve mental performance or to cope with physical disability, are being used increasingly. About the middle of the nineteenth century, Seguin in France was one of the first to work out educational methods of this type for the feeble-minded. Charcot developed a method of re-education for hysterical paralytics: If the patient was incapable of any movement at all in the affected limb, the doctor would move the part himself while the para-

ized person concentrated on the resulting sensations; repetition of the procedure would eventually restore self-activity, but it was essential that the patient pay close attention throughout the training, describe the felt movement aloud, and himself perform the same movement with the unaffected other limb. To enhance awareness of progress Charcot provided his patients with some kind of gauge such as a very sensitive dynamometer to be held in the hand, or a movement indicator attached to the end of the finger. Re-education in various forms is now playing an important part in the rehabilitation of servicemen and war veterans. It may require a good deal of training to learn to substitute other parts of the body for a lost member, or to execute complicated and detailed movements with an artificial leg or arm, or to employ different sense organs for a missing one.

Occupational therapy is a noteworthy instrument for the re-education and exercise of muscles and nerves by means of tasks devised for the purpose. The field of occupational therapy, to which only brief reference can here be made, is broad and rapidly developing. Such arts and skills as painting, weaving, basket-making, working with wood, clay, and cement, and even upholstering, printing, shoe repairing, etc., are used to help restore mental health through the cultivation of satisfying interests. Patients in hospitals for the insane and other institutions often take pride in doing household tasks or gardening. Army and Navy hospitals provide, besides abundant entertainment, opportunity for studying high-school and college subjects and encourage vocationally aimed training and activities. Sanatoria for the tubercular, where rest is essential, find place for less vigorous types of activity, and in some institutions have bedside teachers of the school subjects from the early grades upward. Mental treatment may also take the form of recreation through music, motion pictures, and group activities such as games, sports, dancing, and social gatherings. Recommended reading along helpful lines is prescribed by some psychotherapists. All these therapeutic avenues have been demonstrated to have value in public and private institutions as well as with individuals treated in private practice.

Contributions of Psychologists. Up to the present time professional psychologists have had much less to offer psychotherapeutics than

have psychiatrists. The well-trained psychologist is predominantly an experimentalist and research worker. His chief contribution to therapy has been along diagnostic rather than remedial lines. Psychology has produced many and varied mental tests. There are tests of intelligence, interests, personality, social attitudes, vocational abilities, education, etc., etc., which have a very useful place in diagnosis. For instance, information as to the patient's level of intelligence may determine the kind of corrective therapy; or the need for institutionalization or further schooling; or advice as to future business or trade. Other kinds of test results may be similarly helpful.

It must be admitted that the two personality tests which have recently aroused the most enthusiasm as clinical assets are primarily the work of physicians. One is the "ink-blot test," which was devised by Rorschach in Switzerland as early as 1921, though it attracted attention tardily in the United States. The blots were first made by dropping ink on paper, which when pressed together gave a symmetrically shaped form. Now a series of ten standard cards is used, each with a carefully selected blot; some are colored. When a card is presented to the subject, he is asked to tell what he sees. The scoring is based on the nature of the associations suggested. If the subject sees human forms, he is believed to be interested in human beings; if he reads movement into the figure, this is supposed to indicate that he possesses creativity and a rich emotional life; if gray and black rather than color are the integrative agents that determine interpretation, the subject is suffering from an anxiety, etc. However, interrelationship of responses also figures conspicuously in scoring. Though psychologists have raised questions as to the validity of the Rorschach tester's deductions, the test has attained such popularity that it is now much used in both individual and group form. Another personality test of the same type is the thematic apperception test of H. A. Murray at Harvard. Series of photographs are presented to the subject with the explanation that this is to be a test of his creative imagination, that he is to make up a plot or story for each picture. Tests like this one, the Rorschach test, and the play techniques and psychodrama mentioned earlier are regarded as "projective," in that the individual reveals his inner life through some form

of expression. Besides being diagnostic and therapeutic, projective methods may serve as a gauge to determine progress of therapy.

Psychologists perform services having direct or indirect therapeutic value through many agencies, such as the courts, institutions for the feeble-minded or delinquent, orphanages, hospitals and hospital clinics, and especially child-guidance clinics. The non-directive counseling of the psychologist Carl Rogers, already described, was developed in a child-guidance clinic. The current work of psychologists in American hospitals is explained in the *Journal of Consulting Psychology*, 1944, No. 8. Where there are psychiatrists employed also, as in psychiatric and neurological hospitals, the psychologist gives mental tests to aid the psychiatrist in diagnosis, but the clinical interpretation of the psychologist is often an important contribution. In such organizations as the Henry Ford Hospital (general) in Detroit and the Children's Unit of Rockland State Hospital, New York, the psychologist is a therapist as well as a tester. In hospitals for the tubercular there is no fixed policy regarding psychological services. Private mental hospitals seldom employ psychologists. The armed forces of the Second World War have benefited greatly from the proficiency of psychologists attached to hospitals and other units. The major psychological activity for combat and training is mental testing and concerns selection and placement of men preponderantly; but the psychologist's duties in personnel and morale work, aviation psychology, etc., may be broadly clinical, and, to a limited extent, therapeutic.

Some psychologists maintain offices for private practice. These consulting psychologists are not generally psychoanalytical in their therapy,

but use the therapeutic interview for many purposes: (1) to investigate the needs of the client; (2) to provide him emotional release and relief; (3) to give fitting encouragement and reassurance, essential information or interpretive explanation, and common-sense advice and guidance if it is needed; and (4) to suggest desirable environmental changes, such as a better daily regime, family readjustments, and improvement along educational and vocational lines. One of the best-known consulting psychologists is Henry C. Link of New York City, who has done much to encourage a stimulating, sensible application of psychology. Some practicable therapeutic techniques are now emerging: for example, conditioning in various forms seems to have some utility; and emotional control and shock therapy effected in psychological ways appear promising. The Second World War has stimulated interest in therapeutic applications on the part of psychologists. Even hypnotism, so largely of experimental concern in the United States, has recently been turned more often to practical account.

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R

RACE PSYCHOLOGY.—Fifty years of investigation of the problems of race differences have produced many studies by anthropologists and psychologists; the period has been equally significant because of the development of improved experimental and investigational designs and the improvement in statistical techniques. In spite of much evidence which has gradually accrued, there still exists confusion with respect to race differences; indeed, scarcely any national group is free of political and economic prejudices toward races; even, in some cases, to the point of racial discrimination and persecution. The merest outline of even the most significant of the hundreds of studies of human groups which have been completed during this century would occupy far more space than can be allowed in this volume. For these, the reader is referred to the periodical surveys which have been made by Garth (44, 45), Klineberg (67, 69), Mann (90), and others. In this chapter there will be presented certain considerations which should be kept in mind in the critical evaluation of studies in race psychology.

I. THE PROBLEM OF RACE

The basis of the classification of races has not always been clear or consistent. Some have used a national or political criterion, and thus French, Dutch, Germans are regarded as races; others have used linguistic terms such as Aryan or Semitic; still others have used a religious basis, regarding Jews as a race. The confusion is increased when one political group uses a linguistic term—Aryan—for one part of its population and a religious term—Jewish—for another. Clear thinking on problems of race demands a clarification of terms; in the present discussion, classifications based upon national, political, linguistic or religious terms are eschewed in favor of physical and inherited criteria. The term "race" will be used to describe an arbitrary classification of the human family based upon an inherited physical trait or a series of traits.

Furthermore, the physical criteria so used must be relatively independent of environmental influences; it is expected that the members of the "race" will pass on the criterion physical traits from one generation to another.

Various criteria have been used by investigators for their classifications—pigmentation, facial angle, hair texture, nasal index, blood type, biochemical differences, endocrine dominance, constitutional differences, and so on (67, 127). Some investigators have used combined criteria. But neither single nor multiple criteria have produced definite segregations; in all classifications there is overlap, and only in respect of gross differences have segregations been satisfactory.

It should be borne in mind that classifications are made by the process of abstraction. The classification is, therefore, a theoretical construct, not a reality. Abstraction involves the selection of certain traits and the exclusion of others. The classification of the human family into races results in groups which are selective with respect to some arbitrarily selected trait or traits and, at the same time, random with respect to many other traits. If, for instance, a classification were made upon the basis of one inherited trait, say eye-color, the groups formed should be selective samples with respect to eye-color, and should be random samples with respect to another inherited trait, say, height, unless it can be demonstrated that a relationship exists between eye-color and height—i.e., between the selected and the non-selected traits. Should such a classification yield, for instance, three arbitrary eye-color groups—brown, grey, and blue—there should be normal distributions in each group with respect to height, or thumb-length, or intelligence—unless intrinsic relationships between eye-color and these traits can be demonstrated—and on no logical ground could it be assumed that the mean of one eye-color group is higher or lower than that of any other eye-color group with respect to height, thumb-

length, or intelligence. The working hypothesis of the psychologist, on a *a priori* grounds, should be that between groups which result from the use of one inherited trait or series of traits as criteria, there are no differences with respect to other inherited traits, unless and until relationships between the criterion and non-criterion traits have been demonstrated. It must be admitted that many investigations have been based upon the converse of this assumption; races have been grouped upon some arbitrary criterion; assumptions of inequality in non-criterion traits have been made; and investigations have aimed at the proof or disproof of these assumptions.

In the second place, many classifications have been based upon some measure of central tendency, to the whole or partial neglect of variability. Thus there tends to be set up a hypothetical "average individual" in each group, to be used as an arbitrary criterion for all other individuals. Since, however, every group exhibits variability, it may happen that relatively few individuals in that group will conform to the measurements of the "average individual." The errors involved would probably be of little importance if variabilities of traits were small. But this is not so. In a comparison, for instance, of the mean intelligence-test scores of Fijian and Indian children, it was found (92) that while the mean score of Indian children was statistically higher than that of the Fijian children, more than 30 per cent of the Fijian children equalled or exceeded the mean score of the Indian children. That the overlap in intelligence-test scores between whites and Negroes is too great to be disregarded is shown by the studies that have been made of gifted Negro children (131, 132). The anthropologist has not been unmindful of the fact that the criteria used have not always resulted in mutually exclusive categories, one of the marks of a good classificatory system. For instance, in his classification applied to certain groups in Europe, Hrdlicka (127) classified Germans as Keltic-Nordic-Slav-Baltic and Southern Russians as Slav-Finno-Ugrian-Keltic-Nordic-Tatar. The mixture of "race" and linguistic terms should be noted in this classification.

In the third place, classifications based upon one or more inherited criterion traits provide no warranty that all individuals in the group will exhibit identical or even similar behavior

in some non-related non-criterion trait. To assume such identity or similarity is to deny variability. The behavior of the individual is determined, not by the class into which he may be arbitrarily placed, but by the structure of the psychological field of which he is a part. Psychology still abounds in class analyses. It is sometimes stated that Germans are industrious, frugal and mystical; French are logical and sentimental; Nordics are domineering, self-reliant and courageous, Alpines are crafty, sullen and envious, while English lack a sense of humor. There are, undoubtedly, individuals in each class who exhibit the associated traits; not, however, because they belong to the class, but rather because of certain elements in the psychological field which are favorable to the development of such traits.

The use of terms involving a classificatory system is often essential for ease of communication and for purposes of discussion. In view of the nature of the material and the problems involved it is inevitable that classifications should arise in group psychology. Nevertheless, it is necessary to bear in mind that classifications are abstractions; that they involve variabilities with consequent overlappings; and that the task of describing human behavior does not end with classification.

II. THE PROBLEM OF SAMPLING

Human groups are different with respect to mental and physical traits. The casual observations of travelers as well as the investigations of anthropologists and psychologists have produced sufficient evidence for this statement. The problems facing the investigator of groups are those of determining qualitative and quantitative differences by objective methods, and of estimating the influences which have contributed to the development and maintenance of these differences. The greater number of group comparisons is made between infinite universes. Because of the difficulty or the impossibility of measuring large numbers it is necessary to draw samples from the universes to be compared. It is at this point that the psychologist encounters one of his greatest obstacles. Within reasonable limits, an investigator may define as he pleases the universe he wishes to consider; he may choose adult Polynesians in Hawaii; female Australian aborigines; Aleuts in Alaska, and so on. The drawing of the samples, however, must

conform to rules should the investigator wish to draw inferences about the defined universe from the sample he has observed. "The fundamental condition for random sampling is that each unit or individual of the defined universe must have an equal chance of being drawn, and, once drawn, no unit can be discarded without risk of bias." (93) If, for example, an investigator (4, 30, 31) decides to measure the intelligence of Aleutian children in Alaska and finds himself forced by weather conditions to make stops only at the most accessible villages; and if, in addition, some of the children to be tested refuse their co-operation because of shyness, then it can hardly be said that he has obtained a random sample of Aleuts. His results may be interesting, but his sampling does not warrant any conclusion being drawn with respect to the defined universe of Alaskan Aleuts. It is fair criticism to state that by far the large majority of racial comparisons have failed to pay their respects to this fundamental condition of sampling. The sum total for group psychology has been the accumulation of test results on samples, no one knows how far removed from random, from which no conclusion about the defined universe should ever have been drawn.

Three techniques of sampling deserve consideration by the psychologist. The commonest method, albeit that which has little in its favor save ease, is *accidental sampling*. As its name suggests, it is the method whereby units in the sample are drawn by accident,—ease of measurement, willingness, availability, and so on. It would be interesting to know how many samples, later to become the subject of controversy in racial and social psychology, should have been discarded out-of-hand on the basis of accidental sampling. The *method of random sampling* can be used where there exists a catalogued universe from which units may be drawn. Such a method requires the simple mechanical process of drawing every n th unit in the catalogue. Unfortunately the psychologist interested in comparing groups rarely has a catalogued universe. Since there is little certainty that every individual in an uncatalogued universe has an equal chance of being drawn the method of random sampling is of little value to the group psychologist. In the *stratified method* units are drawn from each of several strata in proportion to the number of individ-

uals in each universe stratum, the strata being decided upon beforehand by knowledge of existing variables that are in some manner relevant to the experimental variable. The advantage of stratified sampling lies in its greater precision; an advantage which is contingent, however, upon knowledge of variables which are likely to influence the experimental variable. There are but few examples in racial psychology of the use of stratified sampling, probably the best are those reported by Klineberg (70) and Franzblau (35). The sample having been drawn, the individuals tested and the results computed, there still remains the need for checking the representativeness of the sample before generalizations can be made. The only certain method of doing this is to compare the results with those of the universe. In group psychology this can rarely, if ever, be done because the universe values are unknown. Other statistical checks have been suggested but none appear to get rid of the bias which may have determined the selection of the original sample. What remains is the complete description of the sample in terms of the known variables of the universe from which it was drawn. Unless this be done, any critical evaluation of the results is impossible, and there certainly can be no justification for generalizations wider than is warranted by the measurement of the sample.

It has already been suggested that the only tenable hypothesis for the psychologist, on *a priori* grounds, is that there is no difference between the mean scores of abilities and traits of groups, other than between those criterion traits upon which the classification was made. This is in keeping with the null hypothesis which states that, since the real values of infinite universes can never be known, the only hypothesis which can be made is that between the means of compared groups there is no difference. True it is, that statistical treatment of the observed data may cause us to reject this hypothesis, in which case we have some justification for the assumption that some difference between means does exist.

III. THE PROBLEM OF TESTING

The comparison of human groups has involved two groups of measurements. On the one hand, there have been measurements of physical and psycho-physical traits; height,

weight, cranial measurements, hair texture, sensory acuity, reaction time, and so on. On the other hand, there have been measurements of mental traits and abilities, singly or in combination, and including general ability, specific abilities, interests, aptitude, and aspects of personality. Most of the former group are susceptible to direct measurement, and some of them, either singly or in combinations, have been used by anthropologists as criteria for segregations. Mental traits and abilities are difficult to measure in any culture. In the first place, there is not yet universal agreement as to the meaning of some of the terms used, e.g., intelligence, attitude and personality; secondly, the values obtained by present tests are the results, not of direct measurements, but of inference. The task becomes doubly difficult when attempts are made to compare the results obtained in one culture with those from another. It would be idle to allow measurement to wait upon universal agreement about definitions. There is common agreement that some units of behavior demand more "intelligence" than others; that some individuals succeed at tasks where others fail. The psychologist interested in the measurement of intelligence must rely upon indirect measurements. So, too, does the physicist. Temperature is measured by the length of a thread of mercury; air pressure by the movement of the surface of a partially evacuated container; electric current by its ability to turn an armature; sugar in solution by the rotation of a beam of light, and so on. The indirect and inferentially obtained values of the psychologist are justified by the methods of measurement used in other scientific disciplines.

The evaluation of intelligence, interests, personality and other psychological elements might be made by a complete lifetime study in one individual of all units of behavior related to these elements. Since, however, it is as impossible to observe all the units of behavior of the "behavior universe" of an individual or group of individuals as it is to measure all units in a population, recourse must be had to the measurement of samples of behavior. Such samples selected should be typical of the behavior universe, and, at the same time, should be sufficiently diverse to cover a wide range of the trait, ability or interest it is hoped to measure. Moreover, it must be emphasized that the sam-

ple selected as typical of one universe cannot, without observable evidence, be regarded as typical of any other universe.

Success in measurement in any field will depend, without adequate assumptive bases, upon happy accident. In most of the assumptions underlying the measurement of intelligence, there is the belief, implicit or explicit, that intelligence is commensurate with the ability of the individual to educe and to make use of relationships. It is clear that intelligence may function over widely differing elements in different cultures. So different may the elements be that one might speculate upon the shape of modern anthropology and psychology did these sciences have their origins in Samoa, Alaska or Bengal instead of in the Occident. Enough is known, for instance, of the cultural sanctions of many co-operative societies to state that some actions regarded as intelligent behavior in a competitive society would, if performed in a co-operative society, be regarded as stupid. Herein lies one of the obstacles in the pathway of the comparative psychologist. On what ground can he assume that a test valid in one behavior universe is equally valid in another? Even within the closest geographical area cultures show marked variation; Negroes and whites, even in the same towns, do not share comparable cultures. The first task of the group tester is to give evidence that the tests are applicable to the sample being tested; until this can be done, comparisons must be evaluated with caution.

Comparisons of intelligence test scores of children of two or more groups have been made using test material that has been standardized on but one of the groups (4). In these studies, the results of the tests on the groups not used in the standardization of the test have usually shown decreasing intelligence-test scores with an increase in age. It surely would not be contended seriously that the intelligence of the children of these groups does decrease with age; results of this kind point more likely either to faulty sampling or unsuitability of the test material at the higher age levels. They also indicate that the comparative psychologist who aims at comparing intelligence, interests, attitudes, personality, indeed any psychological trait, must develop tests so that none of the groups being compared will suffer any disadvantage because of the nature of the test material. It is very

doubtful if this has yet been done, and until it has been, the results are open to criticism. Many of the oft-quoted comparisons are of little value because the test materials and methods were alien to the groups being tested. The best tests will be those that are developed within and out of a knowledge of the culture in which they are to be used. For this reason, psychologists in the United States prefer the Stanford-Binet Scale to the Binet-Simon Scale.

It is unnecessary to enlarge upon the need for standardized test procedures when comparisons are being made. A knowledge of different cultures reveals the fact, however, that procedures in one culture are often impossible to reproduce in another. Time tests are likely to be unsuccessful in cultures which regard with scorn those tasks which take little time; the results of the "drawing-a-man" test are not likely to be useful in a community where one draws an enemy's picture in order to work black magic; nor can one be certain of age groupings in communities lacking birth registration, particularly when birthdays are not, as in Occidental communities, the excuses for annual festivities.

It would appear that, in some respects, the race psychologist has over-reached himself. Many of the comparisons of the past fifty years, it must be admitted, have been made with little knowledge of the culture of the group being measured, and, moreover, without much respect for methods of sampling and adequate statistical treatment. Of more scientific value would be a combined project undertaken by anthropologists and psychologists directed toward drawing a stratified sample of a single group, and the construction and administration of a test within that group. A few such studies co-operatively planned and carried to a successful conclusion would probably provide far more useful comparative material than has been gained from most of the studies of the past fifty years.

Other factors likely to vitiate comparisons will occur to the investigator who has worked in different cultures; the difficulty of securing rapport; the development of motivation, particularly in a co-operative society; the effect of chief-commoner relationships in communities where such ranks are inherited; the familiarity with the pencil-paper situation; the adequacy of two-dimensional pictorial representation of three-dimensional objects; the cultural influence

of magic; attitudes toward white men; influences of selective migration; the cultural effects of miscegenation, and so on. Unless relevant factors such as these are controlled, comparisons are of dubious value.

IV. CONCLUSION

A critical evaluation of the results of racial comparisons involving psychological tests must lead to the conclusion that most of the problems are still unsolved. True it is that there have been useful comparisons of physical traits. But with respect to those elements which have demanded indirect measurements, the results are inconclusive. It is not considered appropriate, therefore, to repeat here the methods and results of investigations which can be found in most textbooks; more to the point is the need for drawing attention to the criteria which should form the basis of critical evaluation of comparative studies.

1. *Race Classifications.*

- (a) The bases of grouping—national; linguistic; religious; or inherited physical traits.
- (b) The proportions of "pure" and "hybrid."

2. *Sampling Techniques.*

- (a) Method of sampling—accidental; random; or stratified.
- (b) Description of sample measured—control of relevant cultural variables.

3. *Test Materials.*

- (a) Method of selection of test items.
- (b) Validity of item analysis.
- (c) Relation of items to cultural situation.

4. *Administrative Factors.*

- (a) Control of physical elements—climate; economy; accessibility.
- (b) Control of cultural factors—socio-economics; language; education; factors specific to culture.
- (c) Control of psychological factors—motivation; rapport.

5. *Statistical Treatment.*

- (a) Sample—method of drawing and checking sample, use of statistical evaluation of sampling errors. Appropriate treatment of comparisons, correlations, analy-

sis of variance and co-variance where necessary.

Criticism of the results of "race" comparisons are fair and, in view of the conditions of measurement, inevitable. Until we know how to distinguish groups, and until more serious attempts are made to develop adequate tests, to control cultural and psychological variables, and to draw representative samples, we shall need to suspend judgment with respect to studies which have claimed to have proved "race" differences. The most satisfactory assumption, and the one which, on *a priori* grounds, should be the basis for future comparisons is that between human groups there are no differences with respect to inherited mental abilities.

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RADIO RESEARCH.—A. *Introduction.* Research in the field of radio was from its beginnings 25 years ago affected by the fact that here was a market in which there was nothing tangible for sale. Unlike visual media, radio had only air time to sell and its ethereal character was obvious to any advertiser. It consequently behooved broadcasting companies to engage in research which would demonstrate to an advertiser that a program could reach listeners at a low unit cost. Early research in radio was thus more oriented in the direction of quantitative surveys that would measure the potential

size of the audience of a station than in the qualitative study of listeners' attitudes, their radio habits, program appeals, etc. This emphasis on quantitative measurement still prevails today. The buyer of radio time naturally wants to know how large a station's market is and what the opportunities are for increasing it.

From the point of view of applied psychology, the research possibilities in the field of radio are not only intensive but extremely manifold. The psychologist interested in market research finds this a most fruitful field. Sampling methods are basic to all kinds of surveys, whether of the radio audience, or of the sales effectiveness of radio advertising. Comparative studies of the audience and commercial effectiveness of radio versus other media offer real challenges to the development of adequately controlled techniques of fact-finding and measurement. The great role that radio communication can play and does play in the social and political life of the nation was earmarked by the election campaigns and "fireside chats" of the late Franklin Delano Roosevelt. Radio has rapidly become a chief, if not *the* chief, medium for the dissemination of news and analyses of current events.

The research possibilities of radio in education offer an attractive field of work for those concerned not only with adult education but also with classroom and formal school education. For the social psychologist the analysis of the social implications of radio broadcasting offers tremendous possibilities. Nor have they gone unnoticed in the role that radio has served in the war effort. The study of the listening habits and program preferences, of adults and children, of the sexes, of different educational, occupational and cultural groups represents a broad area of research that has implications both for radio and business as well as for social psychology. Finally, radio provides a fruitful field for qualitative research in the psychological appeal and effectiveness of different types of talent and different kinds of program ingredients. A picture of many of these aspects of radio research is provided by a perusal of the contents of the references cited at the end of this article.

Some aspects of these varied types of radio research are more psychological in character than others. In fact, it is difficult if not impossible to draw a sharp distinction between

psychological and non-psychological research in this field. The sampling and quantitative measurement of potential and of listening audiences are less psychological in their implications than the study of the attitudes and habits of listeners and non-listeners. There is, furthermore, one large area of radio research that apparently does not concern the psychologist, and that is technical, engineering research, as in radio electronics and radio operation. However, even here the separation is not complete. Although the technical production of radio operation is basically an engineering problem, the effectiveness or satisfactoriness of what machines will do needs to be judged from the behavior and reactions of listeners. This has been recognized as a basic research problem in the development of television.

In summarizing developments in radio research during the past 25 years—which is the age of standard broadcasting—we shall organize the different fields into the following three major areas:

- I. Quantitative Study of Audiences.
- II. Qualitative Study of Audiences and of Program Production.
- III. The Determination of the "Selling" Effectiveness of Radio.

The public itself is the chief source of data for the problems of all of these areas. The following types of devices are employed to obtain the research data:

1. Interviews: (a) by direct contact in the home; (b) by telephone.
2. Mail response: (a) unsolicited; (b) to broadcast announcements of free offers, contests or special appeals; (c) to systematic samples by ballots or questionnaires.
3. Audimeter records of the use (and non-use) of radios in homes for stations, over a continuous calendar period.
4. Polygraph records of listeners' attitudes towards the detailed content of programs.

Generally, radio research attempts to determine how many people listen, when they listen, to what they listen, who they are, how they listen, where they listen, as well as to why they listen; and, finally, how they are influenced by what they hear. All of these research questions are basically psychological ones. Each is concerned with human behavior. However, before we undertake to describe the application of re-

search methods to the study of these many problems, it will be well to have a picture of what the field of radio as a commercial market, as well as an educational and entertainment medium, is today.

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B. *The Radio Market.* Within the span of two decades radio has become one of the chief advertising mediums in our national economy. It has in many ways eclipsed its closest rival in the entertainment field, the motion picture industry. More than 925 stations are at present engaged in standard A. M. broadcasting to the public in the United States. A great majority of these stations are affiliated with a national network organization: The National Broadcasting Co., organized in 1926; The Columbia Broadcasting System, 1927; The Mutual Broadcasting System, 1934; and The American Broadcasting Co., formerly the Blue Network, 1942. Once television, particularly color television, has been satisfactorily developed—this is not the place to predict what will happen—there is little question that this new mode of communication will be an even greater advertising and entertainment medium than is radio today. Radio, in the dissemination of news and comments on current events, the discussion of national and local problems, has also become a major medium of information and informal education. However, from the point of view of formal education, radio has not played the role in our public educational system that it might well have served. Television may come to play a greater role in the lives of growing Americans in this regard. In view of the great value of visual aids in instruction, television should be able to do on a far greater scale what educational movies have attempted to do in the classroom.

Radio in the United States has, on the whole, been operated in the public interest, with the operating income of a station generally dependent upon advertising. Broadcasting is part of our national inheritance. The right of a station to go on the air with a transmitter is a privilege granted as a license by the Federal government. This privilege is contingent upon the provision that a station operate in the "public interest, convenience and necessity." However, the Federal Communications Commission

has no right of censorship over the content of programs. The Congressional Communications Act of 1934 is explicit on this point: "No regulation or condition shall be promulgated or fixed by the Commission which shall interfere with the right of free speech . . ." Broadcasters have worked out their own system of self-regulation and self-control. They are sensitive to public opinion: a housecleaning of programs and commercials in some quarters is currently in progress. By contrast with radio in totalitarian countries, broadcasting in the United States is a servant of the public. And it is free.

The first official count of radio homes by states and counties was made by the United States Census Bureau in 1930. In 1935 an official committee on radio research was organized under the auspices of the Association of National Advertisers, the American Association of Advertising Agencies and the National Association of Broadcasters. In one of its first releases this committee undertook to describe the number and distribution of radios as of January, 1936. The report indicated a total at that time of nearly 23,000,000 radio homes. By 1940, according to the United States Census of that year, the number of radio homes had increased to nearly 29,000,000. By 1945 more than 33,100,000 homes (more than 90 per cent of all homes) were estimated by the National Association of Broadcasters to be equipped with one or more radio sets, distributed as follows: 95 per cent of all homes in cities of over 100,000; 94 per cent for cities of from 2,500 to 100,000; 89 per cent of rural non-farm homes and 88 per cent of farm homes. By economic levels, practically 100 per cent of all A, B, and C income-group homes had radios (42 per cent of the total); 93 per cent of all D homes (37 per cent of the total) and 78 per cent of all E homes (21 per cent of the total) had radios. An additional 8,750,000 were estimated to be in automobiles, and with the duplications of radio sets in homes and radios in public places, hospitals, etc., about 60,000,000 radio sets were estimated to be in use that year. This tremendous distribution of radios in the United States, made possible by the mass production of receiving sets at a low cost, means that practically everyone today has access to a radio. Radio is the ubiquitous phenomenon of communication born only yesterday.

The first commercial program was broadcast

on September 7, 1922 over Station WEAf in New York; the "product" was real estate and the sponsor paid \$100 for 10 minutes of time. Radio developed rapidly as an advertising medium; gross billings for radio advertising increased from about \$5,000,000 in 1927 and nearly \$90,000,000 in 1935 to about \$400,000,000 in 1944. National network advertising alone accounted for nearly \$200,000,000 of this total in 1944. Over \$100,000,000 went for local station advertising; another \$93,000,000 to national and regional non-network advertising and \$7,500,000 to regional network advertising. In the national field of radio advertising, drugs and toilet goods led all product groups with a total of more than \$53,000,000, or nearly 28 per cent of the total gross billings. More than \$42,000,000, or about 22 per cent, was spent in the advertising of foods and food beverages and nearly \$20,000,000, or 10 per cent, for the advertising of cigars, cigarettes and tobacco. The fourth product group was laundry soaps and household supplies, which accounted for another \$12,000,000. Fifth was confectionery and soft drink products, with more than \$10,000,000. These five categories of products, it will be noted, accounted for nearly \$140,000,000 of radio advertising on national networks—70 per cent of the total—in 1944.

An analysis made by the research department of the Columbia Broadcasting System of media expenditures for 1943 by one hundred leading national advertisers showed radio definitely in the lead with \$126,000,000 spent for network advertising. Magazine advertising was second, with a total of \$103,000,000 and newspaper advertising was third with about \$61,000,000.

A further index to the economic aspects of radio is given by radio net *time* sales. In 1935, about \$80,000,000 was spent for radio time. This figure reached nearly \$300,000,000 by 1944.

Finally, the over-all estimate of net costs for radio advertising (including time and talent) during 1944 is placed by L. D. H. Weld as 400 million dollars. His total estimate of net costs for all media is placed at 2 billion, 270 million dollars. Newspaper advertising led the field with a total of 645 million. But radio was second. Direct mail advertising accounted for 300 million, and general magazine advertising was fourth with 285 million.

From the point of view of employment, radio

represents the creation of thousands of jobs that did not replace work in any other field. It, and now television, are new industries. They have given birth to new professions. In 1941, more than a quarter of a million people were directly employed in the radio industry, exclusive of part-time employees and artists.

If we ask what kind of programs radio gives the public, we obtain the following picture,—based on an analysis of commercial network time for the winter season of 1943-4 made by the Cooperative Analysis of Broadcasting. Of daytime commercial programs on the networks, 57 per cent of the time was given to serial drama, about 11 per cent to news and talks, nearly 9 per cent to variety shows, about 7 per cent to drama, nearly 5 per cent to children's programs and between 4 per cent and 5 per cent to classical and semi-classical music. The remainder of the commercial time was given to audience participation shows and non-classical music.

For night-time, commercial network programs, 28 per cent of the time was given to drama, 20 per cent to variety shows, 18 per cent to commentators, news and talks, nearly 13 per cent to popular music and about 10 per cent to audience participation shows. The remainder of the time was accounted for by other types of music and by children's programs.

The picture of broadcasting for sustaining network programs and for local stations is somewhat different from the preceding distribution of network commercial time. Thus a much greater proportion of popular music is used on sustaining programs and by local stations. An analysis by the writer of the radio week, as monitored from 8:00 A.M. to 1:00 A.M. daily, for all broadcasts of the four New York outlets of the four networks, revealed for four sample weeks of 1941 and 1942 that approximately one-third of the total broadcasting time for this period was given to popular music. A similar analysis was made of all programs broadcast from 5:00 P.M. to 1:00 A.M. over three independent stations in New York City. This revealed that more than one-half of their total time was given to popular music. These figures suggest what has for years been fairly typical of radio broadcasting—popular music is the great "filler-in," with recordings and transcriptions playing a dominant role on

local stations throughout the country. This trend has no doubt passed its peak on the networks and is probably at its peak for local stations. This is the case because of the increasingly wider recognition of the value, not only to the advertiser but to the radio station as well, of the development of programs that have an individual character and appeal of their own.

The radio market is thus seen to be a broad domain in which radio sets are available in practically all homes of the United States, millions of dollars are spent by advertisers for this medium, and a variety of program material is available for listening. What about listening? Radio has, of course, gone a long way from those days in the early 20's when John Smith with a crystal set would emerge for work in the mornings, bleary-eyed but happy.

In a national survey made by Elmo Roper for the Columbia Broadcasting System in 1940, it was found that one once-a-week program was heard three times a month by an estimated audience of 50,000,000 men and women. A total of five CBS programs were estimated to have monthly audiences of over 40,000,000. The average CBS program was estimated to reach nearly one-third of all adult men and all adult women, at least once a month. These figures are obviously to be compared with the circulation of some of our leading national magazines. At that time, *Life Magazine* estimated itself to have a circulation for a single issue in a month of 15 million adult readers. The average circulation of the 1,877 daily newspapers in 1940 is reported as slightly in excess of 41 million copies.

The preceding figures are for only one national network and do not of course include listening to other stations. It is estimated today that about 90 per cent of all radio homes tune in to a station at least once a day.

The regular surveys of national listening in telephone homes of urban areas, made by the C. E. Hooper organization, reveal a marked similarity of trend in evening listening and daytime listening during the past several years. Thus, during the winter months an average of about one-third of these radio homes is estimated to be tuned in to programs each evening. During the summer months the percentage of radio homes listening declines to about 20 per cent. During the daytime period the listening is less and so is the seasonal fluctuation, with

an average of about one-sixth listening during the winter months and about one-seventh tuned in during the summer months.

The greatest U. S. listening audience for a radio broadcast to date was the one that the late President Roosevelt made to the nation on December 9th, 1941, at the time of Pearl Harbor. Four-fifths of the nation's homes were estimated by C. E. Hooper to have tuned in—an audience of more than 60,000,000 listeners. On election night in 1944, listening for a whole evening period was at an all-time high. More than one-half of the nation's radio homes were estimated to be tuned in sometime during the period from 7:00 P.M. to 10:30 P.M., EWT. This audience, interestingly enough, was 55 per cent greater than for a usual Tuesday evening. President Truman's V-E Day announcement on Tuesday morning of May 8th, 1945, was heard, according to the C. E. Hooper surveys, by 63 per cent of the nation's radio homes, a figure nearly 400 per cent higher than that for this same time period of Tuesday the month before.

These instances of unusually great audiences point to one of the fundamental facts of radio, namely that the proportion of people in their homes *available* for listening is always considerably greater than the proportion of those actually listening. The proportion of homes with at least one person available for listening, whether or not the radio is actually tuned in to a station, averages about 75 per cent for both day and evening periods, for winter and for summer, with the peak of availability reaching more than 80 per cent during the evening periods of the winter months.

Thus, people listen, but who are they? What are they like? Why do they listen? What do they do while they are listening? And, finally, how are they influenced by their listening? Are they, for example, influenced into buying the products advertised? These are the basic kinds of research questions that have developed out of the radio market. In the following sections we shall describe the chief methods that have been developed and are in use for getting the answers.

C. Quantitative Study of Radio Audiences. The chief types of quantitative audience research that have been developed during the past two decades have been oriented to determine

how many people listen, when they listen, and to what they listen, as follows:

- (A) The size of the *potential* audience of a station or network,
- (B) The audience *coverage* or *circulation* of a station or network, and
- (C) The size of the *listening audience* of a station or network, program or time period.

Sampling, it should be observed, is inherent in nearly all types of audience research. Unlike newspaper and magazine media, which can measure their circulation in the number of copies delivered or sold, radio has to go out into the homes of the nation. A census (*complete* count or measurement) of a population is costly. In general, for radio research as for most market research, the procedure of sampling a population is indispensable to the methods used. When a sample is properly designed according to the principle of randomization or of stratified-randomization, the results can yield satisfactory answers about the population being investigated. A sample yields an *estimate* of an audience, or of whatever is being studied. All such estimates are therefore subject to error and these should always be taken into consideration in the evaluation and interpretation of results.

A. RADIO'S POTENTIAL AUDIENCE

We have seen that radio in its beginning had nothing tangible to sell and that it turned to quantitative audience research in order to have something besides sound effects to exchange for the advertiser's money.

Research for the potential audience was developed first and continues to yield the prize sales argument of many stations, especially in the form of potential listeners per advertising dollar. The methods used, however, have varied considerably, oftentimes to the despair of agencies and advertisers.

Maps of a Station's Potential Audience, Based On the Signal Strength of a Station and Census Figures of Radio Homes. In the early 20's, estimates (in the form of a guess) of the audience potential of a station were sometimes made by a crude map-and-compass method. The station would be located in the center of a circle drawn on a map with a radius of 50 miles, or 100 miles, or according to the guess made. Since then, maps of potential audience have generally been developed on the basis of standards set by the Federal Communications

Commission and on computations made by accepted engineering consultants. A unit of a half millivolt has been employed as a satisfactory signal strength. The measure of potential audience is then set up according to the number of radio homes in a county or other geographical sub-division for the area reached by a station.

Such a measure as signal strength obviously gives no estimate about a station's *listening* audience. It is an engineering rather than psychological approach to the problem of audience potential. It simply lays out the geographical area that can be reached by a station with a signal clear enough for satisfactory reception under normal circumstances. The potential audience of the station, as thus determined, will vary from day time to night time and consequently two sets of maps are usually made in order to distinguish between these two periods of broadcasting.

Potential Audience Maps Based Upon the Fan Mail Received By a Station. Historically, this was the earliest method used by radio stations to estimate their potential audience in terms other than the physics of a station's signal strength. Sometimes mail is solicited by means of a premium or gift token. Maps are then made in terms of the number of letters received per one thousand radio homes in a city or county. Maps expressing the *density* of listeners per county can be made on the basis of different proportions of returns. This method has, however, been thoroughly discredited because of the uncontrolled character of the sampling. The fan mail method, which has also been used to estimate the audiences of programs as well as of stations has been superseded by the systematic mail and interview procedures described in the following sections. The importance of fan mail for other purposes, however, especially in the analysis of the public's reaction to broadcasting, is not to be underestimated. The volume of mail itself, is amazing. In 1941, the National Broadcasting Company and its affiliated stations received more than 6,750,000 letters.

B. AUDIENCE COVERAGE AND CIRCULATION

Maps of Audience Circulation Based Upon a Mail Ballot From Radio Homes. This method has been most intensively developed by the Columbia Broadcasting System. It will be the basis, with some modifications in procedure

but not in principle, for the audience surveys of the Broadcast Measurement Bureau set up in 1943 as an industry research organization, under the auspices of the Association of National Advertisers, the American Association of Advertising Agencies and the National Association of Broadcasters.

The method of the mail ballot attempts to measure the scope of a station's audience for the weekly cycle of broadcasting, on the basis of the *listening habits* of a controlled sample of respondents, as determined from their replies to a mail questionnaire. A station's listening area may be differentiated into several types, as for example, primary, secondary and tertiary, with the differences depending upon the number of listeners to the station—to yield *intensity* of audience circulation. For example, the Broadcast Measurement Bureau is planning for its first nationwide survey, to be conducted in the spring of 1946, to define the primary area of a station in terms of all those counties in which the station is listened to one or more times a week by at least half of all radio families replying to the questionnaire; the secondary area, all additional counties in which the station is listened to once or more a week by from one-quarter to one-half of the radio families replying; and finally, the tertiary areas, those counties in which the station is listened to once or more a week by between 10 per cent and 25 per cent of all radio families replying. Reports on each station's audiences, set up by states and counties will then be made, from which maps can be constructed on the basis of the preceding criteria to give a picture of the audience circulation of a station.

It will be observed that this method bases the measure of audience potential on some degree of actual listening; consequently, the results obtained are more often described today as yielding an index of audience *circulation*. However, in the projection of survey results on to maps and into the future, the index is one of a station's audience potential based on some regularity of listening.

The ordinary sampling defects of mail questionnaires can be obviated to a considerable extent in this mail ballot method by an intensive follow-up of respondents. In the case of the most recent survey by CBS (released in 1945), a 75 per cent return on 250,000 mail ballots was thus obtained. According to present plans, BMB

may attempt to secure a large return, from one million ballots to be mailed, by offering an inexpensive gift token to each respondent. Whether, however, such a procedure will be effective for A and B (high income) homes is questionable. It remains to be seen whether a controlled sample of one million radio homes in the United States will yield a return that can adequately portray the daytime and evening audience circulation for all stations in the 3,072 different counties of the 48 States.

Station Popularity Maps. An interesting variation in the mail ballot method is illustrated by the station popularity surveys of the National Broadcasting Company. In the most recent nationwide survey made by NBC in 1944, more than three million post card "ballots" were mailed to radio homes in all counties and cities of the United States. Included in NBC's survey was the question, what station do you listen to most?, as well as the question, what stations do you and your family listen to regularly? Less than 10 per cent of the cards were returned, to give an uncontrolled sample of less than 1 per cent of the radio homes in the United States. Aside from the question of adequate sampling, NBC's question of "listen to most" has provoked considerable controversy. It is contended that the results to this type of question are a better index of station (or *program*) popularity than of audience circulation.

Maps of a Station's or Network's Audience Circulation Based Upon Personal Interviews in Radio Homes. This method for the determination of the audience circulation of a station has been extensively developed by Dr. Summers (now of the American Broadcasting Company) and Dr. Whan of the University of Wichita. In 1944, the radio homes of the states of Oklahoma, Kansas and Iowa were sampled by Dr. Whan and his associates. These surveys represented a continuing study for both Iowa and Kansas and an initial one for the state of Oklahoma.

The Iowa 1944 study was the seventh consecutive annual survey of radio listening habits and preferences of Iowa listeners. However, because of the gasoline shortage, the farm homes were not sampled by personal interviews, as in previous years. The rural results were obtained from questionnaires sent to parents in farm homes via children in rural schools located in each of the state's 99 counties. All of the village

and urban results, however, were obtained by personal interviews, as heretofore. A total of 8,513 home replies were obtained—an average of one home for each 67 radio homes in the state.

Each respondent was asked to name four stations listened to regularly during the daytime, and after 6 P.M. The question of station popularity was also asked: "To which one of these four stations does the family listen most?" Both types of replies were used by Dr. Whan to develop audience maps of Iowa stations (a Chicago station, WGN, has ranked third since 1940 for the evening period, in per cent of replies for "heard regularly"). As we have already indicated, "heard regularly" is a fairer basis than "listened to most" for audience circulation maps. Dr. Whan uses five types of areas of per cent of regular listeners by counties: (1) 80 per cent or more, (2) 60 per cent to 80 per cent, (3) 40 per cent to 60 per cent, (4) 20 per cent to 40 per cent, and (5) less than 20 per cent. One station, WHO of Des Moines, has had a high primary audience (80 per cent or more of regular listeners) for a great majority of the state's 99 counties since the inception of these surveys.

Provided that trustworthy and properly trained interviewers are used, the home interview method has several advantages over the mail ballot method in that the sample can be more readily controlled, and longer questionnaires can be used to obtain a great deal more information about the listener. For example, in the WHAN surveys questions are regularly included that serve to give detailed information about the listening habits and program preferences of respondents, which can in turn be analyzed in relation to listener differences in sex, age, residence location, education, occupation, telephone homes, automobile homes and daily newspaper subscribers.

Combined Mail-Ballot and Personal Interview Method. One of the most intensive surveys yet to be attempted has just been announced for the summer of 1945. The survey is to be conducted under the auspices of the Federal Communications Commission and is aimed at obtaining information on the amount and kind of radio listening in the United States, especially in rural areas. Several hundreds of thousands of mail questionnaires are to be supplemented by personal interviews of radio families in rep-

representative counties of the United States. This combination of the methods of the mail ballot and home interview should yield a much more satisfactory result than can be obtained by the mail ballot alone. The carefully controlled sample of interview results can serve as a basis for checking possible errors in the mail returns for those areas in which both methods are used, provided of course that the interviews are conscientiously and expertly made.

D. RADIO'S LISTENING AUDIENCE

In contrast to the audience research methods described in the preceding paragraphs, there are additional quantitative procedures in use set up to determine both the size of the listening audience, and, specifically, to what it listens. They are not only ear-counting techniques; they are also methods for grossly differentiating the station *choices* of the listening audience. In fact, the methods now to be described yield information that has come to be accepted by many radio advertisers as the yardstick of the success or non-success of their programs.

Listening-Audience Ratings for Programs and for Stations By the Method of Coincidental Telephone Interviews. The method of the coincidental telephone survey was originally developed on a national scale by the C. E. Hooper organization in 1938. In more recent years it has also been adopted by the Cooperative Analysis of Broadcasting, (CAB), an organization set up in 1931 by advertisers themselves to measure the listening audience.

The semi-monthly sample of radio homes used in the Hooper surveys is drawn from telephone homes in 32 cities, chosen for their large size and urban areas in which each of the four networks have local outlets. The method is "coincidental" in that telephone calls are made to random samples of radio homes to determine what programs are being heard at the time the call is made.

The coincidental telephone surveys of radio listening yield several types of quantitative audience data, per program, per time period, or per station, as follows:

(1) *Available Audience Ratings.* This is a percentage that indicates the proportion of telephone calls made answered by radio homes to the total number of telephone calls attempted. It therefore gives an estimate of the proportion

of people at home with radios who could be listening and who therefore constitute a potential available audience.

(2) *Sets-in-use Ratings.* The sets-in-use rating is also a percentage. It gives the percentage of radio homes in the sample that had a radio turned on. These ratings for each fifteen minute period vary considerably from day time to night time and from winter season to summer season. The peak for the winter season of 1944-45 was reached in February with an average rating of 34.1 for the evening period, and an average of 16.8 for the daytime period.

(3) *Program Ratings.* A program rating is a percentage taken to the same base as the availability and sets-in-use ratings. It is an index that gives a measure of the percent of radio homes in the sample that had their radios tuned to a particular program being broadcast at the time of the interview. Program ratings vary tremendously. During the winter months the Bob Hope and Fibber McGee shows have had ratings higher than 30.0; however, the average for sponsored programs is about 10.0. During the summer months, on the other hand, an evening program rating of 10.0 is very high and the average drops to between 5.0 and 6.0. For the daytime period, program ratings are generally lower, with an average for sponsored programs ranging between 6.0 and 4.0 during winter and summer months.

(4) *Share of Audience Rating.* This index gives an estimate of the per cent of listeners who are listening to a particular program during a 15-minute period. These ratings thus indicate the program's share of the listening audience. They vary even more than program ratings, but cannot be intelligently considered independently of the latter.

(5) *Sponsor Identification Rating.* A sponsor identification rating of 100 per cent would mean that all of the sample of listeners to a given commercial program could identify the sponsor or product advertised. Such an index presumably affords an indirect measure of the effectiveness of commercial announcements on a program. And it certainly can be maintained that unless the sponsor or product advertised by a program is known to the listener, the program has little or no chance of influencing his buying habits. Sponsor identification ratings also vary greatly for different programs. For

obvious reasons, the Lux Radio Theater has long maintained one of the highest S.I.R.'s,—more than 90 per cent.

(6) *Audience Trend Ratings.* Both the Hooper and CAB coincidental telephone surveys are made on a continuing basis and consequently the trends for the preceding types of ratings can be charted as time series. Striking is the similarity of available audiences and sets-in-use trends during the past several years. Audiences begin to fall off with the approach of the spring and summer months, and begin to rise at the end of the summer season. However, it is again to be emphasized that availability ratings do not fluctuate seasonally as much as do the sets-in-use and program ratings. The policy that many sponsors have of dropping their popular big-name programs during the summer months is undoubtedly an important factor in this picture. However, the negative effect of other home activities on radio listening during the summer months is no doubt also great.

The chief advantages of the coincidental telephone method for surveying radio's listening audience lie in the fact that a truly random sample of the "universe" of telephone homes can be obtained; errors arising from faulty memory are at a minimum, or entirely eliminated; and a survey can be quickly made. On the other hand, the chief disadvantage of the method arises out of the fact that only telephone homes can be included in the survey. Only about half of the nation's homes are equipped with telephones. The sample result may not, therefore, be representative of the listening of all radio homes. Whether or not this is the case can, however, be checked periodically by other survey methods that will yield data for both telephone and non-telephone homes.

Listening-Audience Ratings By the Method of Telephone Recall Surveys. For many years the telephone surveys of listening made by CAB were based upon a recall, rather than on the coincidental method. That is to say, a sample of listeners was telephoned during the morning and asked to name the programs heard the night before; similarly the afternoon sample was questioned about its listening during the morning immediately preceding, and the early evening sample was questioned about its listen-

ing during the afternoon. This method was finally abandoned by CAB in favor of the coincidental telephone survey because the unaided recall method tends to operate in favor of well-known programs and to the disadvantage of relatively unknown programs. Both memory errors of omission and commission are common.

Listening Audience Ratings By the Roster Method of Aided Recall in Home Interviews. The roster method of aided recall has been extensively developed for the New York and Philadelphia areas by Pulse, Inc. Pulse's samples are taken by home interviews each month and are stratified with respect to economic type of neighborhood. Within each stratum of A, B, C and D homes, the attempt is made to obtain a random sample of radio homes. After each respondent has recalled the time when his radio was on during the morning, or afternoon, or evening, a roster of the programs broadcast over the stations of the city is presented and the respondent is asked to check those programs heard. Although the roster, personal interview method can be used on a coincidental basis, it has been found to be more feasible when employed on a recall basis. This is particularly the case from the point of view of cost and sampling, since a whole morning period of broadcasting can be quickly covered in an interview at noon.

The roster method in home interviews yields sets-in-use ratings, program ratings, audience trend ratings, etc., similar in type to those already described for the coincidental telephone surveys. In addition, this method has the potentialities for the determination of the characteristics and radio behavior of people, already seen to be an advantage for home interviewing.

The chief disadvantages of the roster type house-to-house survey are two-fold. One is inherent in the character of the method and the other is a technical, sampling problem. We have seen that whenever a method of recall is used prestige programs are more likely to be erroneously checked as heard, and little known programs are more likely to be overlooked. However, the roster method does not suffer so much in this regard as does unaided recall inasmuch as the listener's memory is reinforced. He has a chance to see the names of little known programs. The technical disadvantage is that which

besets the attempt of an investigator to obtain random or stratified random samples of interviews. It is fairly easy to draw a random sample of 3,000 telephone homes from a population of several million such homes. It is much more difficult to obtain a random or stratified-random sample of home dwelling units by door-to-door calls in a city or other geographical area.

Listening-Audience Ratings By Automatic Recorders Attached to Radios. The A. C. Nielsen Co. of Chicago experimented with this method over a period of seven years, at a cost of more than one million dollars, before making its Radio Index service regularly available, beginning in December 1941. A mechanical device attached to a home radio, by consent and with the cooperation of the family, automatically records on a tape the exact time the radio is on and off, as well as the station to which it is tuned.

About one thousand audimeters are now in operation in a cross-section of homes—both rural and urban, telephone and non-telephone—extending from the Mississippi River to the Atlantic Coast. As additional instruments become available, this sample is being extended to cover the nation. The data on listening and listening behavior obtainable by the method are extensive in both their quantitative and qualitative implications for audience research. For the population sampled, they furnish the basis not only for an estimate of how many homes are listening (tuned in!) to a program at any time, covering all hours of the day and night, but also information about the variations in the size of audience at each point throughout a program, the average duration of listening per “turn-on” of radio, the turnover of audiences for a program from day to day or week to week, the flow and switch over of the audience from one program to another, analysis of listening by income groups and other factors known about the sample, etc.

The audimeter method of measuring listening can also be combined with other techniques, especially the home interview, mail questionnaire, pantry inventories, etc., to yield relevant inter correlations of radio behavior with other kinds of behavior, as for example, the buying and consumption of advertised brands of commodities.

The main criticism that has been levelled at this method has been to the point that the audimeter doesn't measure *listening*, when a radio in a home is on and no one hears it.

The Listener Diary Method for the Study of Listening Audiences. The listener diary method yields pertinent data on how many people listen, when they listen and to what they listen, as well as information of a more qualitative kind. When the diary method is used to study the reactions of listeners to specific programs, the method is then usually described as the listener panel technique. The procedure of the listener diary method consists in setting up a sample of radio families in the area to be surveyed. Each family is asked to keep a diary of each quarter hour of listening over a period of broadcasting, usually a week.

An advantage of this method lies in the fact that the sample can be carefully controlled so as to be relevant in chosen respects, such as socio-economic status of the population being studied. No attempt has been made by this method, however, to develop periodic program ratings similar to those obtained by the methods cited in the preceding sections. Obviously the reliability of the method depends upon the conscientious cooperation of the homes included in the sample. This is in itself a selective factor, which possibly may make the results obtained atypical for the population sampled. The chief usefulness of the diary technique lies in its use as a panel method for the qualitative study of audiences and will be referred to later in this connection.

E. QUALITATIVE STUDY OF AUDIENCES AND OF PROGRAM PRODUCTION

In the preceding section we have reviewed the chief methods of research used in the field of radio for the purpose of determining how many people listen, when they listen and to what they listen. We see that these methods are basically ear-counting techniques and yield the quantitative data about potential audiences, of coverage and circulation, as well as about actual listening. We are now concerned with qualitative research methods; that is to say, we shall describe the chief techniques in use to determine who the listeners are, what they are like, how they listen and why they listen.

Most of this research to date has been oriented

towards the determination of an analysis of some of the characteristics of the radio audience and of their program preferences. Studies have also been made of the audience characteristics of stations as well as of programs to determine the dialing behavior of listeners with respect to the regularity of their listening to a given program or station and the extent to which they tune to programs rather than to stations. The attitudes of audiences to given programs have also been analyzed for the purpose of program building—for the determination of what it is that people like or dislike about a program, why they wish to listen or don't wish to listen. The chief method developed for qualitative studies of the latter kind is that of the program analyzer and audience reactograph techniques.

WHO ARE THE LISTENERS?

This question of who are the listeners, what they are like, is generally a problem of determining the composition of the radio audience. The attempt is made to determine the basic characteristics of listeners with respect to such factors as sex, age, education, occupation, socioeconomic status, etc. Since, as we have seen, radios are available to practically everybody for listening, this problem has today come to be localized as that of determining the composition of the audiences for a particular program or for a particular station. The problem has, however, its negative side, namely, the determination of the characteristics and attitudes of people available for listening, but who do little or none of it.

One of the methods commonly used to determine who are the listeners is that of the personal, home interview, aided by carefully prepared interviewing techniques and tested questionnaires. Relevant information on these questions, particularly for national network programs, can also be obtained for telephone homes by telephone interviews, even though the population studied by this method is restricted by virtue of the fact that less than one-half of the homes in the nation have telephones. Data on audience composition can also be obtained by the distribution of questionnaires by methods other than the personal interview, as, for example, the mail ballot or by Dr. Whan's 1944 method of sending questionnaires into homes via high school students. The chief short-

coming of these latter methods lies in the danger of bias through inadequate samples of listeners, as well as of homes. Unless, for example, a very high return is received from a carefully planned mail ballot of a random, or stratified-random, sample of a population, the returns are likely to be biased and, unfortunately, biased in ways not entirely ascertainable.

The Nielsen audimeter method is useful in giving a picture of the economic type of home composing a program's audience. The audimeters, of course, don't record who in the home was listening. However, by mail questionnaires and personal interview procedures, the objective record of the "dialing behavior" of the radio can be supplemented to give a more detailed picture of what the listeners to a program or station are like. The economic factor alone is, of course, of great importance to the advertisers. Thus, Nielsen reports for an average of thirteen programs of concert music that 13.9 per cent of upper income homes were tuned in, 11.6 per cent of middle income, and 9.2 per cent of lower income homes. By contrast, for an average of ten daytime serial programs, 7.7 per cent of upper income homes, 8.6 per cent of middle income homes, and 10.3 per cent of lower income homes were tuned in. Many programs are found to have higher ratings in rural homes than in urban homes, and vice versa. Sex, age and education are also three important variable factors in the composition of the audiences of different programs or time periods and different stations. Dr. Whan, in his study of the 1944 Kansas audience finds, for example, that a greater proportion of urban men than of women listen from 10:30 to 11:00 at night; that the chief age difference in listening occurs in the late evening hours, with, as might be expected, a greater proportion of young people than of older people doing the listening. Because of the correlation of education and age, more of the college people also listen during the later evening hours.

The importance to the advertisers of such information about the composition of a program's audience is obvious. If he sells a product, such as tooth-paste, that is widely purchased by people of both sexes, by adults of all ages, by people regardless of their education, income status and type of residence, he naturally wants a type of program that has an appeal for all

kinds of peoples. On the other hand, a cigar manufacturer is more concerned in having a hearing by a male audience, and is less concerned about women listeners and young people.

HOW THEY LISTEN

The question of how people listen is differentiable into two major aspects. On the one hand, it is relevant to ascertain what people do while they are listening, and, on the other hand, it is obviously of value to determine how they select their programs. Both of these types of problems have been studied by methods utilizing personal interviews, mail questionnaires, and the second type of problem dealing with the dialing behavior of listeners has also been most objectively studied by the use of audimeters attached to radios in their homes.

Co-Listening Activities. A pioneer study on the problem of determining what people do while they are listening was conducted more than a decade ago by Frank Stanton, who used a mail questionnaire sent to homes of a sample whose radio behavior he had studied by the use of mechanical recorders attached to their radios. He asked the listeners to check the following: "The radio was turned on while I, write, dance, bathe, sew, eat, study, lie in bed, clean the house, read, play, iron, work, rest, talk, ride, cook, boat—and listen (that is, do nothing else)." Space was provided for the listing of additional activities and the listeners were directed to check only those things that they did regularly. For men, the highest co-listening activities were eating, resting and reading. For women, however, the story was different. Their co-listening activities were chiefly sewing, resting, ironing, eating, cleaning, reading and cooking. Such sex differences are obviously attributable to the home occupations of women and their greater availability for listening during the day.

Another early investigation was conducted by A. L. Eisenberg about ten years ago in a study of the role of radio in the lives of several thousand metropolitan New York children: 38 per cent of the girls and 28 per cent of the boys reported co-listening activities. The chief co-listening activities of the boys and girls were reading, doing homework, eating, and playing, with sewing also an important co-listening activity of the girls. Radio has become today one of the principal leisure time activities of chil-

dren. In fact, for people generally, listening to the radio probably occupies more of their time around the clock than any other activities excepting sleeping and working.

It is well known that some types of program material is much more suited for co-listening activities than are others. During the war some research progress has been made in the programming of music while people work. Obviously music that is in the tempo of a funeral dirge or of hot jazz is not conducive to the maintenance of good working habits. On the other hand, music of types found to be appropriate has been found to be the most appropriate radio material for listening during different kinds of work activities whether in the factory or in the home. The extent to which the daytime serials represent the most satisfactory radio material to the housewife while working has not been satisfactorily determined. However, the high program ratings obtained during the morning period by music and audience-participation shows, such as *The Breakfast Club* and *Breakfast at Sardi's* of the American Broadcasting Company and straight programs of popular music such as Martin Block's "Make Believe Ballroom" over WNEW in New York, definitely indicates that many housewives do not prefer serial dramas while they work.

Adjacent Listening—The Flow of Audiences. The tuning-in, tuning-out, and switching-over behavior of listeners in the dialing of their radios offers a very fruitful field of research in the qualitative study of listening. The two chief sources of information available today on this aspect of audience behavior are through the roster method of aided recall in home to home interviews, as developed by Dr. Roslow of Pulse in New York and Philadelphia, and the audimeter surveys of Nielsen. In the roster method, the respondents are asked to check the programs that they heard over a period of time. In the latter case, the audimeter objectively records not only when the radio is on and off, but also the station or program to which the radio is tuned at any particular moment. The habits of listening homes from program to program, and during a program, can thus be readily ascertained. A listener or listening home can be characterized in terms of what was listened to before and after a given program. In other words, in addition to the tuning in and tuning out behavior of the listener, pertinent informa-

tion about adjacent listening both before and after a program, as well as the flow of the audience during the program, can be ascertained. Thus, for any given program, the following information is relevant and available:

1. The proportion of a program's audience that did not have their radios on, either before or after the program.

2. The proportion of the audience that also was tuned to a program on the same station, either before or after the particular program.

3. The proportion of the audience dialed to programs on other stations, either before or after their listening to the particular program.

Information of the first type provides a basis for estimating the specific appeal for the particular program. Thus, if a program has a great proportion of tune-ins and tune-outs, it is evident that the listeners turned to their radios because of the particular appeal of that broadcast. Information of the second and third type provides a basis for an estimate of station "loyalty" and switch-over behavior of listeners. When such data are analyzed for the possible interrelations of program appeals and the characteristics of listeners, pertinent information of value to the producer and advertiser alike is obtained.

The audimeter also provides a record of *program loyalty*. Nielsen reported in 1944, for example, a "holding power" of 85 per cent (per cent of total programs tuned to by average home) for daytime serials, 79 per cent for news programs, as compared with 63 per cent for popular music and 59 per cent for concert music.

An example of adjacent listening is provided by Fishman and Roslow in *Radio Research: 1942-1943*. In an analysis of listening to "Your Hit Parade," broadcast over the Columbia Broadcasting System on Saturday evenings, 41 per cent of the sample of listeners in New York to WABC (CBS's station) were found to be tune-ins, and 29 per cent were tune-outs. An additional 21 per cent were already tuned to WABC at the beginning of the program, and 60 per cent continued listening to the broadcast over the same station at the conclusion of the program. The switch-over from one station to another was much greater at the beginning than at the end of the program: 38 per cent of the listeners to the Lucky Strike broadcast had switched their dial from another

station at the end of the broadcast. It is evident that this program had a very specific tune-in appeal for a large part of its audience and that the program following also profited.

The results of adjacent listening studies have revealed a greater degree of specific appeal for news programs at certain times of the day or evening than for any other type of broadcast. For example, the same authors in an analysis of adjacent listening of a Frank Singiser news broadcast over WOR, of the Mutual Broadcasting System, New York, at 6:30 P.M., two-thirds of the audience were tune-ins and about one-third of the audience were tune-outs. Interestingly enough, another one-third switched over to Lowell Thomas's news program on WEAF of the National Broadcasting Company at 6:45 P.M.

The Cumulative Audience and Audience Turnover. A further type of audience behavior that has received increased attention in recent years is that of the turnover of audiences. Although this problem considerably overlaps the domain of quantitative methods for estimating the audience circulation of a radio program, it nevertheless is germane to the qualitative study of listening behavior, particularly when the latter is analyzed with respect to such factors as sex, age, education, etc. The point is that many more people listen to a program at least once a week, or once a month, than listen to one particular broadcast.

One study by the listener diary technique indicated that a daytime serial drama had total listeners during the week that numbered but 80 per cent more than the listeners on an average day, whereas a musical program had listeners 190 per cent greater during the week than for an average day. The national survey made by Elmo Roper for the Columbia Broadcasting System, earlier referred to, revealed that many programs have a monthly audience two or three or four times larger than that of a single broadcast. Nielsen has given considerable attention to this aspect of audience research. The audimeter records of his 1944 sample of a thousand homes reveal a considerably higher turnover for daytime shows than suggested by the preceding diary study. Thus the average daytime program was tuned to by 8 per cent of the sample homes for one broadcast, but by 30 per cent over a period of four weeks. This signifies a considerably greater impact value

for the advertiser using daytime programs than their low audience ratings per broadcast would suggest.

WHY THEY LISTEN

A systematic and a detailed answer to the question of why people listen gets at the heart of the psychology of radio listening. The general question, however, needs to be subdivided: Why do people listen at all, and why do they listen to the particular programs chosen from among the many available? The answer to the first one of these two questions is known in a general way. People listen for relaxation or entertainment; they listen for information; they "listen" with no particular object in mind, having nothing else to do. However, the relative importance of each of these types of reasons for listening, analyzed further with respect to sex, age, education, occupation, etc., of listeners, constitutes the questions for research, and, as we have previously indicated, the question of why they don't listen is just as important from the point of view of broadcasting and program building as the question of why they listen.

The chief methods in use for ascertaining the reasons why people do or do not listen are those of the personal interview and the mail questionnaire. The personal interview method has been employed in home-to-home surveys, with listener panels and with the program analyzer technique. The mail questionnaire, however, is too unreliable a method for a direct attack in this basis question of "why?"

Program Preferences—Likes and Dislikes of Audiences. The program preferences of listeners throw some light on reasons for listening. For example, the Whan surveys of the Iowa listening audience for five successive years, 1940-1944, reveal that news broadcasts have rated highest as the best-liked program type, with about 75 per cent of women and more than 80 per cent of men checking this kind of broadcast as among their five best-liked types. Comedy programs have consistently ranked second, with more than two-thirds of both men and women liking this type of program, and popular music has generally ranked third, being liked by nearly 50 per cent of the respondents.

It would therefore appear that one of the most important reasons for radio listening for both men and women is to obtain news information. This has been accentuated by the war.

The next most important reason is for entertainment and relaxation. Many people also appear to listen for inspiration; about one-quarter of Iowa women and about one-sixth of Iowa men checked religious music as a type of program liked. Other types of information, in addition to news, were also liked; about 10 per cent of both men and women in Iowa checked talks on farming as a best-liked type of program material.

An analysis of preferences for specific programs, rather than of program types, throws additional light upon "why they listen." According to the 1944 Whan survey of the Iowa audiences, 46 per cent of men and 41 per cent of women checked the Fibber McGee program as one of their best-liked programs—and indicated that they "liked the program well enough to try to hear it regularly." The Bob Hope show came second with both men and women, but with men the WHO (Des Moines) news broadcast ranked third and with women the Lux Radio Theater ranked third. With women, the WHO news broadcast ranked fourth. Beyond this point the difference in the preferences for specific programs of men and women were rather striking. However, in view of the general availability of news broadcasts at various times of the day, the interesting point about these results is that a specific news program ranked so high. This again points to the quest for up-to-the-minute information about the news as one of the fundamental reasons for listening. When Iowa listeners were asked, "On which do you depend most for national and war news? . . . newspapers, radio, magazines, or conversation with other people?", more than two-thirds answered radio. This figure is particularly significant in view of the fact that 94 per cent of all families interviewed stated that they subscribed to a daily newspaper. As would be expected, the proportion depending most on radio was considerably higher for farm men and women (being nearly 80 per cent) than village and urban folk.

A classification into program types of all those specific programs checked by the Iowa listeners as their best-liked ones, revealed that comedy programs were first with both men and women, and war programs were last with both men and women. Only about 1 per cent of men and women named the latter type of program among their best-liked ones. Dramatization of

the war is evidently not much of an inducement for listening.

When Iowa listeners were asked to indicate types of programs desired but not available at different times of the radio day, little agreement was found among them. Greatest agreement was for popular music, with about 1 per cent of all listeners interviewed wanting it but not finding it available sometime during each successive two-hour period of the day.

Attitudes of Listeners—The Method of the Program Analyzer. "Why they listen" is also revealed by an analysis of the reasons for attitudes expressed by listeners towards specific programs and the detailed content thereof. The methods known as the Program Analyzer and the Listener Panel Technique have been developed for such analyses. Although the attitudes of listeners towards a radio program do not in themselves reveal the psychological reasons for listening, they afford considerable insight into the reasons for the success or non-success of the broadcast itself.

A great advantage to the method of the Program Analyzer arises out of the fact that listeners' opinions about what they heard, and the reasons for their attitudes, can be checked against the immediate expression of their attitudes as recorded on a polygraph while listening to a broadcast. The method has been mainly used in studios, but with portable equipment it can also be used in the home or at informal gatherings of listeners. Each listener is given a green button for the right hand and a red button for the left hand and is directed to press the green button when what he hears is liked or satisfactory and to press the red button when what he hears is disliked or unsatisfactory. Each listener's buttons are electrically connected with styli on a polygraph. Hence, an objective record of all reactions is obtained which are correlated with each detail of a broadcast.

This method for the analysis of the reaction of each individual listener to each successive aspect of a radio program was originally developed by Paul Lazarsfeld, Director of the Columbia University Office of Radio Research, and Frank Stanton, General Manager of the Columbia Broadcasting System. A somewhat similar technique for the analysis of the attitudes of a group as a whole, rather than also of each individual member, and known as the Audience Reactograph, was independently de-

veloped in 1938 by the Engineering Department of WHO in Des Moines. Instead of using buttons, the listener in the Reactograph method turns an arrow on a dial scaled "Excellent," "Good," "Fair," "Poor," "Bad" and "Lousy."

From the polygraph record of the reactions of each individual listener to a broadcast the researcher can readily determine those types of program material that listeners like and those types that they dislike. An analysis of results by age, sex and education, etc., can also be readily obtained. Care of course must be exercised in the sample of audiences used in such studies if generalizations to be drawn from the results are to have validity for the producer or program builder. In the interviewing that follows a Program Analyzer test of a radio program, the investigator can also determine at least the conscious reasons of the listeners for their likes and dislikes of a broadcast as a whole as well as for any particular part.

Whether or not a program succeeds in building up a favorable mood in its listening audience can be determined by an intercorrelational analysis of Program Analyzer results. The audience effectiveness of a commercial as compared with other parts of the program can be ascertained. In one analysis of a well known program, made by Mr. Tore Hallonquist, of the Columbia Broadcasting System, and the writer, it was found that a middle commercial, presented in the entertaining mood of the broadcast itself, integrated well with the program as a whole from the point of view of the attitudes of the listeners. That is to say, the same listeners responded about as favorably to the commercial as to the rest of the program, which a great majority liked; and generally those listeners who were indifferent to or disliked the commercial were the same individuals who were indifferent to or disliked the program. However, the same result did not obtain for the straight independent type of commercial given at the end of the broadcast. A great majority of the listeners, who otherwise liked the program, were not interested or disliked the announcement at that point.

Individual differences in attitudes for different types of talent, male stars, female stars, etc., can be determined in the dynamic setting of the broadcast itself with the use of the Program Analyzer technique. Whether or not the use of a particular type of program ingredient, as, for

example, musical bridges, or terse announcements, or gags, are overdone or not well-done can be ascertained.

The study of listener attitudes and the determination of the reasons for their attitudes is essential to any sound approach to the problem of program building. There is little excuse today for a producer of a program to rush on to the air with an unrehearsed broadcast and with all fingers crossed, wondering whether the audience will like it. By the use of the Program Analyzer or the Audience Reactograph technique, radio programs can be pre-tested. Many of the "bugs" can be eliminated and the producer can go on the air with a program in which he can have justified confidence. The chief difficulty in the use of these techniques lies not in the method itself—which has been demonstrated to be satisfactory—but in the problem of sampling. Adequate cross-sections of the audience need to be employed in order for an analysis to have sufficient validity to be acted upon in the revision or recasting or general evaluation of a broadcast.

The Listener Panel Method. The listener panel method consists of the selection of an appropriate sample of persons who agree to listen to a series of broadcasts and report their reactions to what was heard. Formal questionnaires are usually provided for this purpose. As indicated earlier in the listener diary method, this technique has the advantage that arises in controlled sampling. Elaborate questionnaires can be used to obtain a great deal of relevant information about the listeners themselves, as well as about their listening habits, program preferences and reactions to the programs heard. Furthermore, the method of the listener panel has the advantage that the listening is done and the questionnaire is filled out in the home situation. Bias, of course, may enter into the result. Panel members may have favorable attitudes because of a desire to please or they may develop unduly critical attitudes, or they may tend to express what they think they should say rather than what they think. In other words, the method itself, being essentially a questionnaire technique dependent on the conscientiousness of the respondent, is subject to unreliability of measurement, even though the sample panel can be satisfactorily established.

Mr. C. H. Smith of the Columbia Broadcasting System has employed this method in a

series of systematic studies. Qualitative information of the following kind are reported:

1. An over-all evaluation of a program by means of a rating scale.

2. A measure of the listeners' tolerance for a program—"If you had tuned to this program by accident, at the beginning, do you feel that you would have listened to all of it?" If the answer is "No," the listener then indicates the particular point in the program at which his interest waned (however, it will be observed that the answers to this latter question were not satisfactory inasmuch as some listeners found it difficult to be specific; this points to the advantage of the Program Analyzer method over the listener panel technique for the study of listener reactions and attitudes towards the detailed content of a radio broadcast).

3. The possible future appeal of the program, obtained by asking listeners whether they would listen "regularly" or "only occasionally" or "not at all" to programs of a similar nature.

4. Attitudes about particular aspects of a broadcast such as the commercials, narration, music, etc., by the use of a rating scale questionnaire.

F. MEASUREMENT OF THE "SELLING EFFECTIVENESS" OF RADIO

Intertwined in the quantitative and qualitative measurement of audiences, but in addition to these types of research, is the problem of measuring the actual selling effectiveness of a program. The phrase "selling effectiveness" should be construed in its broadest sense to include more than the selling of advertised products. It includes, for example, the effectiveness of radio in the sale of war bonds, in the drives for the salvaging of metal and of waste paper, for enlistment of women in the military services, for Red Cross donations, etc. In general, it includes the effectiveness with which whatever is broadcast for a specific purpose is "put across" with the audience. A program is thus effective to the extent that it yields results in line with its objective.

Sales Effectiveness of Commercial Programs and Announcements. Research methods for the measurement of the sales effectiveness of radio are but at the threshold of extended use. The radio sponsor is primarily concerned with the effectiveness of radio in the sale of specific products or in the development and maintenance of

good will (institutional advertising) for his brand or trade name. Radio advertising is generally based on at least one of the following three premises: (1) People listen, then they buy, (2) the more they listen, the more they buy; (3) the more they listen, the more likely they are to continue to buy.

The research problem of determining the influence of radio listening on the purchases and buying habits of listeners is usually complicated by the fact that most manufacturers and retailers employ more than the one type of advertising medium. It is difficult to disentangle the sales effectiveness of radio advertising from that of newspaper, magazine, display and direct-mail advertising. Where an advertiser of a specific product is using radio as his only medium of advertising, the research problem is less complicated. Various methods for measuring sales effectiveness have been developed and the chief ones that have been used will be briefly reviewed in this section.

Robert F. Elder summarized some of the early, unsatisfactory methods in a 1931 publication, "Does Radio Sell Goods?" A more recent summary of procedures by A. M. Crossley in an article on "Radio and Sales" was published in *Variety's Radio Directory* of 1940-41.

Sales Volume Before and After Radio Advertising. The determination of selling effectiveness by this method consists in the computation of the sales volume figures of a product for a period *before* and an equal period *after* radio advertising. Even if other advertising media are not employed during such a study, this method is not sound because of seasonal and cyclical fluctuations in trade, variations in sales policies and personnel, as well as in distribution methods.

Consumer Testimony. Another method consists in asking consumers what kind of advertising has most influenced their buying. This procedure is psychologically unsound because many advertising effects are likely to be unconscious. The consumer may think that he knows, but his testimony is all too likely to be unreliable.

A later variation of this method consists in telephoning people while a program is being broadcast to ascertain (1) whether they are listening to the program, and (2) what brand of the product being advertised they use. Unless rigorous controls are used, this method is

unreliable, because of unintentional errors of commission in the association of the sponsor's trade name with the answer to the brand question. Furthermore, interviews alone, whether face-to-face or by telephone, may yield unreliable results about product use and buying habits of some types of products, especially with respect to the regularity of use and volume of purchases.

Analysis of Fan Mail. The analysis of fan mail, whether unsolicited or in response to "free offers," box-top "coupons," etc., may be productive of valuable insights for the producers of programs and the development of commercial announcements, but it is an unreliable method to measure sales effectiveness of radio advertising. A large volume of responses may be elicited but the advertising may not prove effective in selling merchandise. The character of the program itself may be such as to draw many listeners but few buyers.

Brand Usage in Radio and Non-Radio Homes. This is a method recommended by Elder. More than 100,000 post-card questionnaires asking for brand names of nine commonly used, rapid-turnover products, were mailed to homes in ten cities. Brands of each product were heavily advertised in other media, but some brands for each were radio-advertised and some were not. Thus, a comparison of the use of radio-advertised brand names in radio and non-radio homes should show the effectiveness of the radio advertising. Although this post-card method of measuring *use* is unreliable, Elder reported that radio-advertised brands were used in about 30 per cent more radio than non-radio homes. Furthermore, non-radio advertised brands were reported used about 10 per cent less in radio homes than in non-radio homes.

We thus have here the beginnings of controlled investigations in the measurement of sales effectiveness. Even with a more reliable technique for the determination of brand usage, this particular method, however, is of little or no use today because of the small percentage of non-radio homes.

Brand Usage in Listening and Non-Listening Homes. If radio and non-radio homes cannot be used as the experimental differential between otherwise "matched samples," then why not compare brand usage in homes that listen to programs advertising a given product with

brand usage in homes that don't listen to these programs? If more listeners than non-listeners use the product, it has been argued, then the radio advertising has been effective in making sales. The situation, however, is not quite so simple as this. Thus if the *appeal* of a radio program is similar to the appeal of the product, brand usage will be high with listeners. Again, if the program appeal is rural and product appeal is urban, brand usage will be high in urban homes despite a low volume of listeners. Controls obviously need to be employed if the difference in brand usage of listeners and non-listeners is to be taken as an index of the sales effectiveness of radio advertising.

Matched Samples of Listeners and Non-Listeners. Two general approaches, employing controlled techniques, have been developed. On the one hand, the brand usage of matched samples is compared—one sample having had no opportunity for exposure to the radio advertising and the other, having had exposure. On the other hand, the brand usage of matched samples of known listeners and known non-listeners to the radio advertising is compared. The first of these methods requires the use of two separate but otherwise comparable market areas, one of which is exposed to the radio advertising and the other, not exposed. The second requires an accurate record of listening and non-listening over a period of time such that the brand usage of a group of listeners can be compared with that of non-listeners—each group having been matched in relevant characteristics, such as age, sex, education, purchasing power, family and residence status, etc. Both methods require an objective index of brand usage, either by the method of periodic retail store inventories, or of household inventories, or of systematic records of purchases made by an adaptation of the method of the listener diary technique.

An example of an investigation that illustrates aspects of both of these approaches to the problem is reported by Frank Stanton in the *Journal of Applied Psychology* of 1940. The attempt was made to measure the sales influence of a specific radio program. The experimental design aimed to isolate the sales effectiveness of radio advertising alone for a product that was also advertised in other media. How many units of a product did radio sell that would not have otherwise been sold? In market A, the product was radio-advertised; in market B, the

control sample, the product was not radio-advertised. In both of these urban markets the advertiser's sales factors were "exactly comparable." Both markets were also fairly well matched in size of population and the number of retail outlets of the manufacturer's product.

Three types of measurements were made to determine: (1) over-the-counter retail sales of the brand advertised by dealers in the radio market A and in the non-radio market B; (2) whether families in market A that listened to the program bought the brand more, less, or as much as families that did not listen; (3) whether families that listened "regularly" were more frequent buyers of the brand than families that listened only "occasionally." Measurements in both market areas were made as objectively as possible by the use of field investigators who visited the retail outlets and made periodic checks of their inventories and sales of the product. Home listening and non-listening to the program in market A were initially determined by a coincidental telephone survey of a random sample of more than 4,000 families. Families of both listener and non-listener groups were then interviewed. Their customary listening habits to the program were ascertained by carefully constructed questionnaires and the pantry inventories made.

After a month of such field work, it was found: (1) that the total retail sales of the brand of the product were 88 per cent greater among dealers in the radio market areas than among similar dealers in the non-radio market; (2) the use of the brand was 81 per cent higher than the next most popular brand of the product among families that listened in the radio market, but among non-listeners in the same market the use of the brand was only 7 per cent higher; (3) among regular day-to-day listeners in the radio market, use of the brand was 263 per cent higher than that of the nearest competing brand, whereas among occasional listeners the use was only 59 per cent higher.

Further refinements on the preceding investigation have been made. Increased reliability is obtained by the establishment of matched panels of listening and non-listening homes in the same market area, or in two or more areas. The extent of listening and non-listening to the radio advertising over a substantial period of time can be objectively differentiated by audimeters attached to radios. Non-listeners, occasional lis-

teners, and regular listeners can then be matched for the factors already mentioned, such as purchasing power, family, educational and residence status, etc., as well as for the exposure of both listener and non-listener groups to non-radio advertising of a product (over a period of time, as well as currently). Include with these controls regular and objective inventories of the purchases of the product and we have the essence of a well-designed market research investigation that should reliably isolate, over a period of time, the effectiveness of radio advertising for the products studied.

There is of course no question that, in general, radio advertising, whether through programs or by "spot" commercial announcements, has been effective in the selling of merchandise. The research problem is one of isolating the sales effectiveness of radio for specific products.

Direct Selling By Radio. Some products have been sold directly to the public via radio advertising. The publishing house of Simon and Schuster, for example, recently radio-advertised its \$1.00 annual Income Tax Manual. They sold 750,000 copies on credit by direct mail to people who replied to their money-back guarantee advertising via spot commercials. During the same season, they also sold 750,000 copies via other outlets, but the year before, without radio advertising the total sale was about 750,000 instead of 1,500,000 copies. This result does not of course demonstrate that the use of radio doubled sales. The changed tax situation no doubt increased the general demand. Many listeners, aware of the availability of the volume on newsstands, may have taken advantage of the credit, money-back guarantee feature of the radio-advertised offer. On the other hand, listeners may also have made newsstand purchases as a result of hearing the "commercials." In any event, this example points to the possibilities of the direct selling of some products over the air—and this will doubtless be augmented for mail order houses once television is well developed.

Radio As the Only Advertising Medium. The "pulling power" and sales effectiveness of radio has of course been continually attested to by the advertising of new brand names, or of department store "specials," etc., for which, in a given market area, radio has been the only formal advertising medium employed. By frequent inventories of retail sales outlets, by

household inventories of listening and non-listening homes, determination of trends in sales effectiveness can be more readily and reliably made than when other advertising media are also employed.

Selling Effectiveness of Non-Commercial Radio. Few well-controlled investigations have been published that demonstrate the effectiveness with which radio has sold bonds, recruited labor, influenced public opinion, etc. Millions of dollars of war bonds have of course been sold via radio, but the extent to which they wouldn't have been purchased otherwise has not been isolated. More revealing, perhaps, of the selling effectiveness of radio has been the response to recruitment announcements. And, of course, radio's power to influence public opinion has been suggested again and again—most sensationally perhaps by Orson Welles' broadcast a number of years ago of the invasion from Mars. In the hands of a Hitler, radio is a power to conquer and destroy. In the hands of free peoples, it can be a power for peace and democracy.

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RAT IN ANIMAL PSYCHOLOGY, THE.—*Introduction.* It has been said that if one were to write a physiology confined to one form, and one form only, of animal life, as good a physiology of the dog could be written as of man. If a similar statement were made for psychology, the rat would have to be substituted for the dog. In fact, one textbook has been written (25), covering the major topics in psychology, confined wholly to the rat. Judged by scientific standards, it stands up very well,

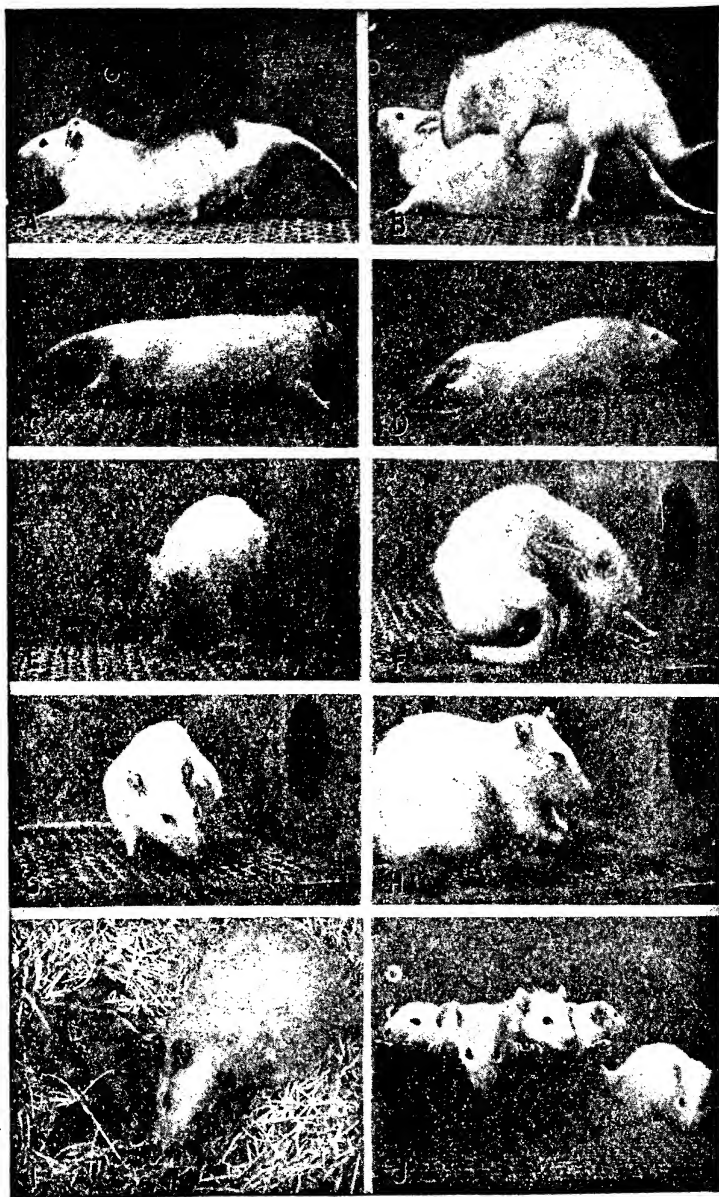


PLATE I—Some typical views of the albino rat. A shows lordosis in the female, to pelvic digital stimulation. B, copulation. C and D, beginning of parturition, E, F and G show typical postures during the birth of the young. H, eating the placenta. I, nest with mother and young. J, young at 21 days of age. Taken from J. Q. Griffith and E. J. Farris, *The Rat in Laboratory Investigation*, Philadelphia, J. B. Lippincott Co., 1942, by permission of the publisher and the courtesy of Dr. Farris.

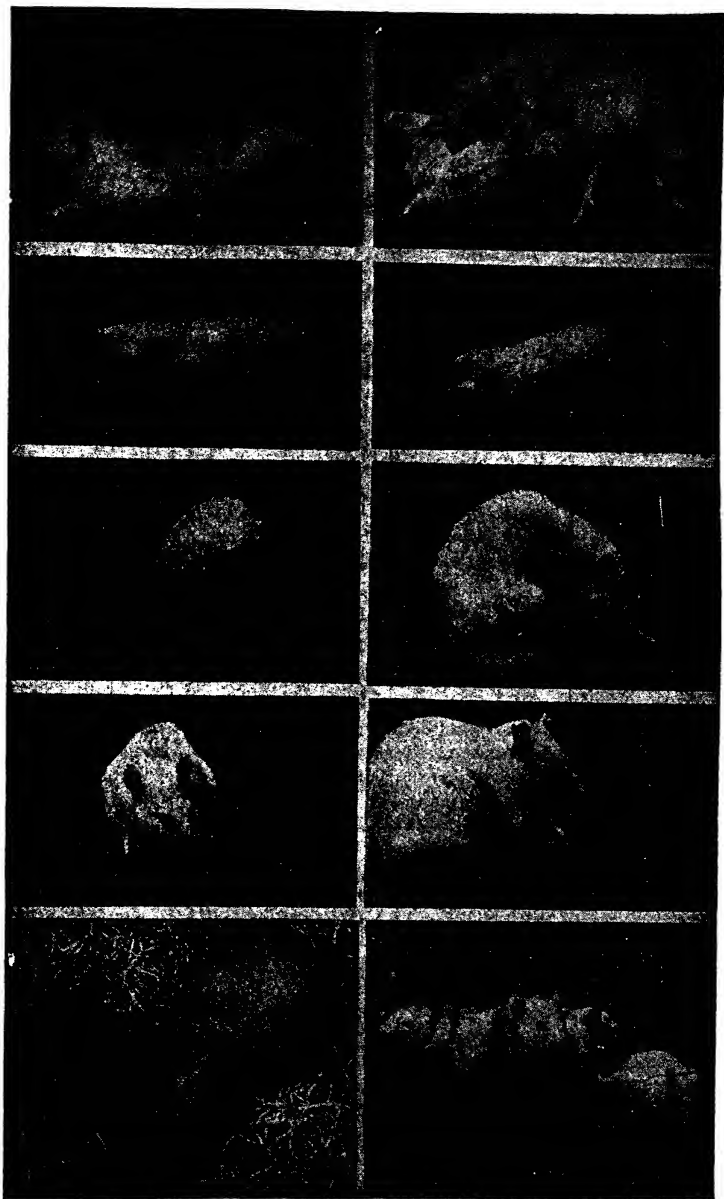


PLATE I—Some typical views of the albino rat. A shows lordosis in the female, to pelvic digital stimulation. B, copulation. C and D, beginning of parturition, E, F and G show typical postures during the birth of the young. H, eating the placenta. I, nest with mother and young. J, young at 21 days of age. Taken from J. Q. Griffith and E. J. Farris, *The Rat in Laboratory Investigation*, Philadelphia, J. B. Lippincott Co., 1942, by permission of the publisher and the courtesy of Dr. Farris.

"the science of science." It would presumably furnish a basis, if accepted, for the establishment of the scientific method as practiced in the laboratory. Undoubtedly most of the chief discoveries made in science have been independent of this or any other philosophical background except perhaps in an unconscious way by the investigator. As long as it does not get wordy, for example, to the point where it tries to be operational about itself, it probably contributes to the ease of mind of the investigator working on a specific problem in the laboratory.

In very simple terms, the core of the doctrine amounts to this: the meaning that a concept has in science is derived from the operations that are performed in its measurement. According to Bridgeman (4), this came about from the influence which the theory of relativity had upon physics. The older conceptions of, for example, an ideal space and time were inadequate, and a re-definition was called for. What space and time actually are, in physical theory, is dependent on how they are used, and this in turn depends on how they are measured, the actual operations performed in these measurements. Accordingly, the space of common experience becomes that which yard-sticks measure, but there are likewise interstellar and atomic spaces, measured by light years and Angström units, which employ quite different operations, and therefore have different meanings.

Carrying this notion over to psychology, intelligence becomes that which its tests measure; learning, that which is measured when the psychologist carries on studies which he calls learning; instinct, a concept which evolves from another kind of study; and heredity still another, if the processes turn out to be different from those carried on under instinct, etc. The consideration of such broad concepts as intelligence, instinct, learning, heredity, etc., i.e., to what might be referred to as the chapter headings of psychology, suggests both the possibilities and limitations of the operational point of view. In studying learning, for example, the psychologist performs a heterogeneity of tasks which, as we shall see, has defied the efforts of the theorist to reduce them to a set of common properties. For the present we must be content to say we study many learnings, not learning, and we are uncertain as to how many. Less than two decades ago the meaning of "in-

stinct" was subjected to extensive criticism and dropped from psychology as a chapter heading, but this did not dispose of the phenomena usually considered under this topic. If the other chapter headings had received as rigorous treatment there would have been nothing remaining but "the organism as a whole" to discuss and it is doubtful if it could have been differentiated from the environment.

No scientist is ever thorough in the application of a point of view to his descriptions. In studying rat maze learning, the investigator may apply the operational method very carefully in the definition of his particular learning problem. He ignores it in telling what he means by a maze and a rat. Presumably a set of physical, mechanical operations would apply to the maze, although few psychologists could describe them successfully without reviewing introductory physics and even then run a strong chance of failure, but what about the rat? Stevens (30) amusingly discusses what is meant by "Dobbin is a horse" in considering the problem of generality. If we can make the fundamental operation, a differential response or discrimination, we assume "this is a rat," and the experimentalist would probably lock out of the laboratory anyone wishing to contest the assumption. But when laboratories fail to corroborate one another's findings, a frequent suggestion refers to the possibility that "our stock colony" may be different. With inbreeding for homogeneous stock, "this is a rat" is coming to be an insufficient discrimination for most experimental work. Thus the operational point of view may be clarifying in definite problems, but more insight is required before the general concepts are successfully defined and delineated.

Special Methods. Specific methods peculiar to animal psychology are best described in terms of the apparatus used in their investigation. Almost anyone who has ever read an introductory text in psychology is acquainted with the maze, discrimination box, obstruction box, delayed reaction box and assorted varieties of apparatus for particular problems. Of them all, the maze remains the instrument *par excellence* in rat work, largely because it is so well adapted to this animal. A thorough examination of rat maze studies could lead the man from Mars to suspect that this animal was evolved for this particular instrument. Today social and edu-

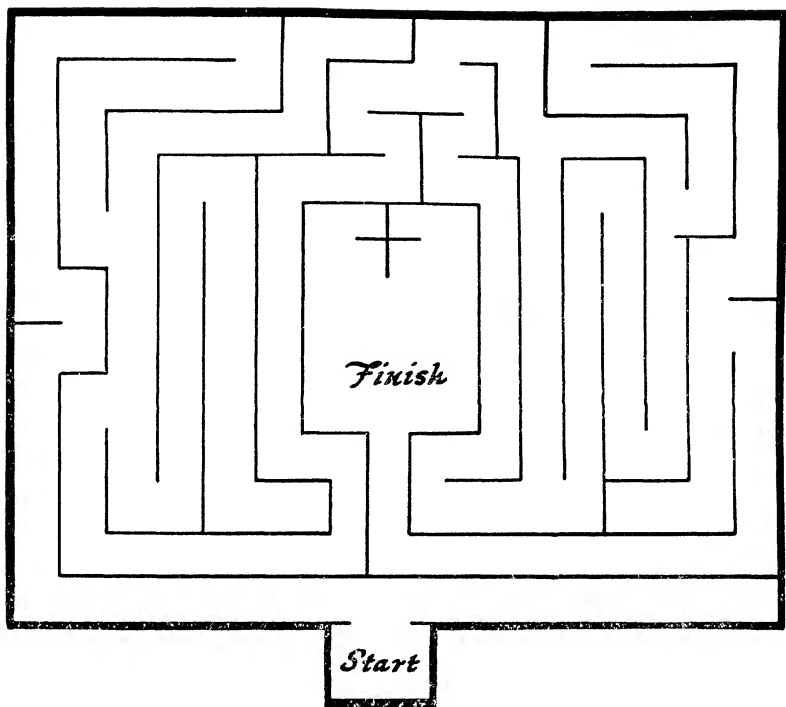


FIGURE 1—Floor plan of the Hampton Court Maze, an early maze pattern, used by Small and Watson. From J. B. Watson, *Behavior*, p. 103, New York, Henry Holt & Co., 1914. By permission of the publisher.

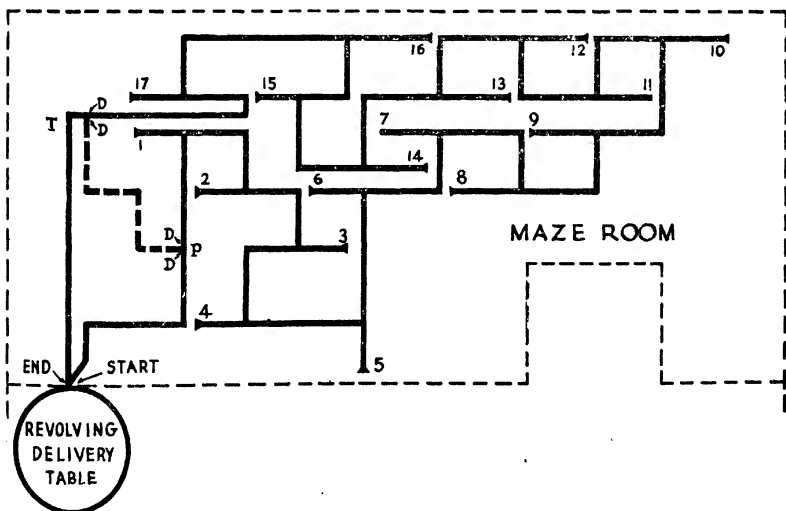


FIGURE 2—Diagram of a multiple T maze, used by Tryon in his study of the influence of heredity in maze learning. Redrawn from *J. Comp. Psychol.*, 1930, p. 158, by permission of the publisher.

cational psychologists are beginning to speak of the environment as a maze, i.e., a pattern of choices in life involving blind alleys or frustrations, true pathways and rewards. Perhaps I should mention that a maze is a series of pathways with a beginning (starting box) and end (goal or reward box) and usually several blind alleys between them. In the early work a maze was just that, patterned after the one at Hampton Court in England (see fig. 1). Other

usually regard it as learned and therefore not inherited. Yet we read of careful studies showing learning to be a function of heredity. Under these circumstances we might resort to the operational point of view and ask what is meant by the term heredity.

In order to get an answer we should ask what operations are carried on in the genetics laboratory where heredity is studied. Here, in its simplest terms, we find the geneticist se-

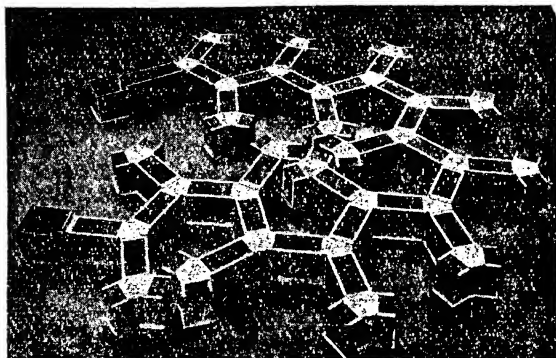


FIGURE 3—View of a multiple Y maze, designed by Warner and War- den, an example of a more recent design of increasing popularity. Photograph courtesy of Geo. H. Wahman Mfg. Co., Baltimore, Md.

designs were not essentially different until the subject of maze reliability came up. Then it was found that certain uniformities were desirable and mazes began to be constructed out of units strung together. Popular units included the T, U and Y (see figs. 2 and 3). However, some of the more enlightening studies have come from less reliable and hence less popular designs. For the details of these methods the reader is referred to the more extensive treatments given in animal psychology texts listed in the references.

HEREDITY, MATURATION AND INSTINCTS

With the remarkable development which took place in genetics in the twentieth century, one might expect that the term heredity would have a well-established meaning. But we find the concept used in opposition to environment and also as opposed to acquired. Yet environment and acquisition are hardly synonymous terms. When we think of behavior as acquired we

lecting individuals (plants or animals) of opposite characteristics (structural or functional), crossing them, and determining the results in the offspring. The experiments may involve complications exceeding the understanding of any but the specialist, but as a beginning, they concern at least as much as has been outlined above. If the animal psychologist wishes to study the inheritance of any trait, be it learning ability, neurotic behavior, wildness, handedness, or what not, he follows this pattern. We note that he begins with a discriminable difference (opposite characteristics) which he proceeds to inbreed or cross to discover the nature of the offspring with reference to the trait. The process may have to be carried on for several generations to get meaningful results, but the pattern is clear. One kind of heredity is defined operationally by the breeding experiment—the crossing of opposite characteristics and the determination of the result in the offspring.

It might be that heredity means more than

this, where Mendelian principles, either on a simple or complex basis, do not seem to apply. In studies of skin patterning in fish, for example, a blending results which is said to be difficult to explain by the operation of complex genic conditions alone. Likewise geneticists have not ruled out the possibility of cytoplasmic heredity. Patterns may be laid down in such an early stage of development that it is difficult to draw a line between heredity and whatever else is left—call it un-heredity, for the moment. It is suggested that the axis between the nucleus of the egg and the point of entrance of the sperm may determine bilateral symmetry, and that the sperm does not enter the egg at any point at random but at a point which is previously determined by a pattern already established in the egg. Is this pattern, since it already exists before the fertilization of the egg, inherited, and, if so, what part do genes and chromosomes have to play here?

When such possibilities are taken into consideration, it would be better to qualify the hereditary we have been defining operationally and refer to it as Mendelian heredity, and indeed, this is frequently done. It is too much to expect that this practice would become universally adopted, however, and we can continue to expect the generic term, heredity, to be used in many ways, some of them loose and fuzzy in their meaning, and one of them, at least, standing for some operations which can be carried out in the laboratory, namely, selective breeding experiments. Whether other meanings of heredity will have to be adopted to produce a situation similar to that in physics regarding space, will be determined by future work.

This does not condone the common practice in psychology of ascribing hereditary nature to other concepts which *seem* to imply it. It is one thing to have evidence that heredity plays a part, quite another to *believe* it does, to assume it merely because this has been a common practice in the past. Instinct is a short, concise term, with a simple modifying form, instinctive. Once in good repute, it was banned from the vocabulary, but is coming back into use again. There is a variety of behavioral phenomena to which the term is as applicable and as well determined as other varieties to which other terms are applied with no greater confidence about their meaning, e.g., maturation, motivation, learning, etc.

Stone (31) has outlined how Darwin avoided a strict definition of instinct and how he recognized that no criterion could be applied universally to separate instinctive phenomena from other varieties of behavior. These criteria include performance without experience or without knowledge of purpose, which amounts today to performance of a well-integrated complex response without the possibility of learning. The introduction of the qualification "complex" raises the question of what is meant operationally by this term. It is usually introduced to separate instinctive activity from unconditioned reflex activity, but this "simple" behavior has complex enough features for the neurologist! In his chapter on instinct in the *Origin of Species*, Darwin does refer to the difficulty of separating instinctive behavior from habits which he presumed could become heritable, pointing out in such cases that the distinction between them was indistinguishable. This certainly implies an hereditary nature of instincts and this view is orthodox today. While this may be acceptable as a *belief*, it is certainly in order to question, in keeping with a consistent definition of *Mendelian* heredity, what breeding experiments were performed to substantiate it. Unfortunately, no experimental work of this sort has been reported and the term should be divorced from its hereditary connotation in the Mendelian sense.

This criticism applies, in fact, to "simpler" reflex behavior. The distinction is often made between conditioned and unconditioned reflexes that the first is learned or acquired while the second is innate or inherited. Thus, Skinner (29) writes that the terms conditioned and unconditioned "could be replaced by others of arguably equal merit. Thus, for example, we might retain the term 'inborn reflexes' and call the new type 'acquired reflexes'" (p. 61). We can assume by "inborn" he means inherited, and they may be, but what breeding experiment established it? The fact of the matter is that unconditioned reflexes are just so many raw facts. What is meant by the term unconditioned is that no processes were carried out in a laboratory to bring them into being. How they came into being is a problem for someone to study. If all members of a species exhibit them, this is another fact, interesting, no doubt, but not evidence of their inheritance. The species may be pure bred with reference to this

behavior so that the Mendelian experiment may not be possible unless a mutation occurs, but this does not make the assumption of inheritance wholly gratuitous.

In 1921, Child wrote (6):

"Apparently there is no escape from the conclusion that organismic pattern is not inherent in protoplasm but arises in the final analysis from the relation of protoplasm to external factors. . . . Cytological investigation, however, has established beyond question the fact that every cell of the individual body possesses normally the full complement of chromosomes and therefore supposedly the complete nuclear pattern of the fertilized egg. Nevertheless, different cells of the body become different and different kinds of organismic correlation arise between them. . . . Local conditions rather than nuclear pattern must be responsible as activating factors for the origin of these differences between the cells, but many biologists have either not discussed the question or have failed to recognize the fact that if all the cells are originally alike they cannot of themselves become different" (pp. 17-18).

The term maturation is used to refer to the differentiation of parts, and to the growth and development of these parts from a relatively simple to the more complex stage where functioning is possible. These changes are to be conceived as no less lawful than the differentia found in Mendelian heredity. Unfortunately they do not build up into nearly as beautiful a conceptual scheme as those subsumed under the laws of unitary characters, dominance and recessiveness, independent assortment, etc. They have been largely studied by the experimental embryologist and the forms which best illustrate their operation are usually lower than that of the rat in the phylogenetic scale.

Thus, Child's principles of physiological gradients have been worked out on planaria, and similar lower forms, rather than mammals. Similarly, Coghill's principles of differentiation of behavior segments from a larger generalized mass were developed from work on the salamander. Studies of maturation in the rat include those of Gonzales, Carmichael and others and in a general way indicate that there are no major exceptions in this form to the lawful principles more precisely illustrated in lower forms.

The general intention of these introductory

remarks regarding heredity, instincts and maturation has been to emphasize the problematical nature of these concepts. The student of animal behavior is not faced with the problem of classifying samples of his field. He does not, in fact, he cannot, select a sample and state: this is inherited; take another and call it matured behavior; pick a third and classify it as instinctive; go on to a fourth and place it with acquired or learned responses; etc. It would not be especially enlightening if he could but the fact is that with respect to any sample of behavior, he is on what Stone (23) has phrased "the trail of developmental controls." He "must look for effective variables operating in an otherwise standard matrix of dynamic factors" (p. 45). He must, in brief, study each sample as a function of a large number of independent and interdependent variables, some of which are controlled through germ plasma (by means of selective breeding), some through the interaction of parts in embryonic development, some through subtle interstitial factors, some directly through the mechanisms at play in the functions studied, and some through external environmental influences. With this in mind we shall go on to a consideration of studies in the rat which have shed some light on these variables.

Mendelian Heredity. The application of Mendelian principles for purposes of selected breeding has been applied to the behavior of the rat with reference to a few characteristics so that it is possible to make something in the way of a statement which expresses more than a belief concerning the inheritance of the following traits or characteristics: *a.* visual discriminations; *b.* maze learning ability; *c.* activity; *d.* experimentally induced seizures; *e.* temperament; and *f.* handedness.

a. Albinism in the rat, as in every other form that has been studied, is a simple Mendelian recessive characteristic. Inferior visual discriminatory ability has been reported for the albino rat compared to the normal pigmented animal. The albino has difficulty making discriminations between horizontal and vertical lines subtending visual angles less than 86°, while the pigmented animal is able to carry discriminations down to approximately 52° of angle. In the first case, the retinal image is approximately 79 microns in width and in the second, 48 microns. Since this difference is directly dependent upon the difference in functional ability of the albino

and pigmented eye, it follows that this visual discriminatory ability is accordingly dependent upon heredity. This point is probably so obvious that it has not been emphasized in the literature.

b. Some years ago Tryon (35) began his well-known selective breeding experiment in which maze bright and maze dull rats were in-

bred for successive generations. The pattern of the multiple T maze used in this study is shown in fig. 2. In 1940 he made his last report on the differences obtained by this process. Beginning with a heterogeneous group in which the extremes for brightness and dullness were selected, he was able by the eighth generation

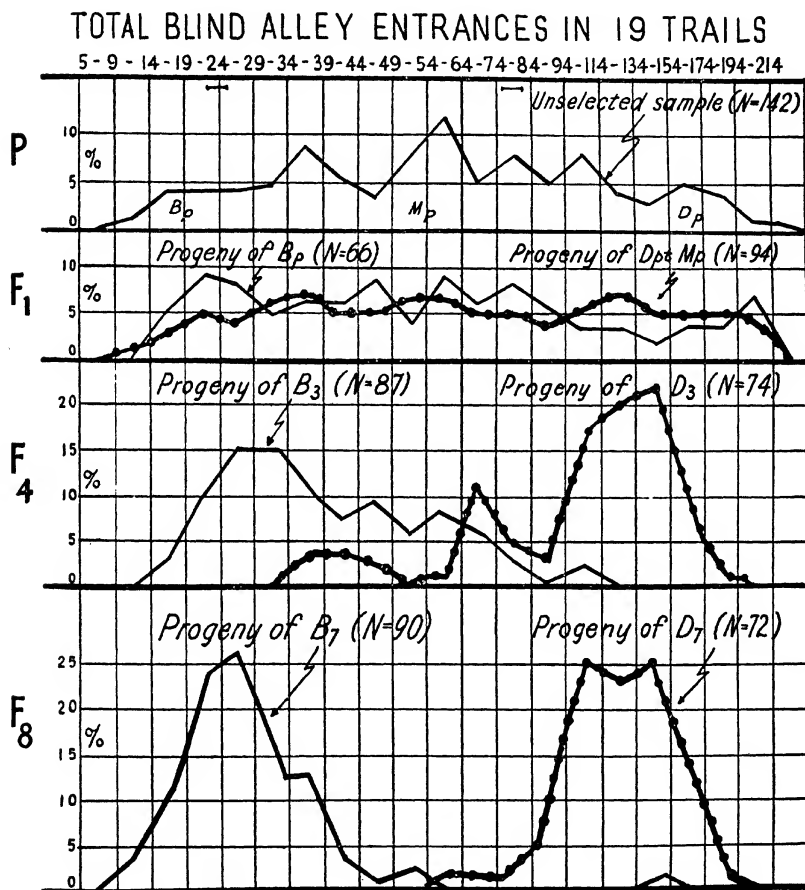


FIGURE 4—Distribution of error scores in maze learning for successive generations of animals selected for "brightness" and "dullness." Only representative generations from Tryon's study are shown. P represents the parental stock with which the study began; F₁, the first generation from crossing "bright" animals with each other, and "dull" animals with each other; F₄, the fourth generation of such selective breeding; and F₈, the eighth generation. It will be seen that, as the selection continued, the lines became increasingly distinct, until by the eighth generation there is very little overlapping in ability between the "bright" and "dull" lines. Reproduced by permission of the National Society for the Study of Education from its Thirty-ninth Yearbook, Part I, "Intelligence: Its Nature and Nurture." Chicago: Distributed by the University of Chicago Press, 1940.

to produce two distinct strains of animal with very little overlapping in their abilities. That is, the dullest offspring from the bright line seldom were inferior to the brightest offspring of the dull line. The results for successive generations, beginning with the parental generation and continuing to the 8th filial generation, are shown in fig. 4. (It will be noted that the scale of abscissa changes twice with increasing errors, and a normal distribution was evidently not obtained to begin with.) It will be seen from the graphs that the separation of the two lines becomes increasingly distinct to the 8th generation. The results suggest multiple genetic factors operating in cumulative fashion. Following Tryon's analysis, we might let ABCD . . . represent genes for brightness and abcd . . . represent genes for dullness, so that a bright line would be AABBCDD . . . and a dull line aabbccdd. . . . Crossing these should give AaBbCcDd . . . in the F_1 crossed generation, and all offspring would be alike in this respect. Thus they should all be at the mean, except for chance and environmental fluctuations. At any rate they should show much less variability than further crossing in the F_2 and later generations. Such crossing, however, produced as great variability in the F_1 generation as in the F_2 generation. Tryon has suggested that the results at present can be best accounted for by assuming that some of the factors are dominant for brightness, some (but fewer) are dominant for dullness, and some operate cumulatively. The Minnesota studies, under the direction of Heron, based on a similar plan of inbreeding, are furnishing corroborative evidence, although they have not been carried as far at present. Such studies furnish the best evidence we have for the influence of heredity on learning ability. They furnish an analogy for what might be expected in humans and far surpass the studies of family lines, about which so little is actually known, and of twins, which are the chief arguments for the influence of heredity on human mental ability at the present time.

The bright and dull lines of rats obtained both by Tryon and by Heron have been tested in other situations as well. In one such test in "hypothesis" situations no difference was found in the ability of the bright and dull animals to form hypotheses, although there may have been a difference in the kind of hypothesis used. The

"maze bright" animals tended to use a spatial hypothesis while the "maze dull" animals tended to use a visual hypothesis. Another test, performed, however, only on the F_2 generation, indicated a somewhat higher metabolic rate in the bright animals. A third test of the F_{17} generation suggested that the bright animals ate somewhat more and at a slightly faster rate than the dull animals.

c. Another study, also carried on in the Minnesota laboratory, tested activity by means of the revolving drum. Early generations of active and inactive strains were selected phenotypically; later generations by the progeny test. The F_{12} generation gave well separated lines of active and inactive rats. A maze test of the F_{17} generation indicated that the active strain was significantly superior to the inactive, as measured by error scores. However, the difference of these strains in maze ability was not as great as the difference of the F_4 generations selected for maze performance itself.

d. The study of audiogenic seizures and neurotic behavior has occupied so much recent attention that this is a subject for a special review in this volume. Mention will merely be made here of studies concerned with heredity of this behavior. In one study, key jingling for two minutes each was used to induce the seizure. Depending on the degree of susceptibility thus found, assorted matings were resorted to and the F_1 generation tested in the same fashion. About 75 per cent of the offspring of "neurotic" rats crossed with each other were "neurotic." About 50 per cent of the offspring of "neurotic" rats crossed with normal animals were "neurotic," while none of the offspring of normal animals crossed with each other gave seizure behavior. These results suggested the inheritance of the behavior as a unitary dominant trait. However, later investigations failed to corroborate these results. On the basis of another test, with breeding carried on to the 6th generation, an increase was found in the percentage of seizures for the line suggested for this behavior and a decrease for the line selected against it. In this study it was suggested that the results might be due to a di-hybrid factor, but not to the unit factor suggested in the first study. A still later report points out that the factor of age needs to be controlled in a study of the heredity of this characteristic. There is an increase in incidence of seizures with in-

creasing age up to approximately 150 days, whereupon few of the animals which had failed to show them up to this age were added to the list of those which could be induced to have a seizure. In this study only the F_1 generation of selective breeding is reported with no definite conclusion to be drawn from the data with respect to its heredity. The age factor does indicate, however, the care which has to be used in studying the influence of heredity in a trait of this sort where the precise tests for measuring the susceptibility of the animal to the seizure are not well standardized. From the results thus far reported, it will probably turn out that the characteristic has an hereditary basis, but it is doubtful if this will be even as simple as a di-hybrid factor.

e. The early report of Yerkes on wildness or savageness in rats indicated an hereditary basis for this trait, and later studies have corroborated the findings. When tame albino laboratory rats are crossed with trapped wild animals to obtain half-breeds and quarter-breeds, which could be compared with the wild animals crossed with each other and with the tame line itself, a blending of this trait is obtained so that by the measures used, the half-breeds are about half-way between the wild and the tame, and the quarter-breeds about halfway between the half-breeds and the tame. Of great significance in this connection is recent work indicating that the gene responsible for black coat color also produces tameness. It is masked in the albino by the failure of the black to show up under these circumstances. This work indicates that other genes, e.g., for piebaldism, pink-eyed yellow, hairless, etc., may make similar contributions to temperament.

By using what is called an open-field situation and measuring emotionality or timidity by means of defecation and urination scores which have a high degree of reliability, selective breeding has been reported for the F_8 generation of inbred animals giving low and high scores. The scores were obtained by means of the number of days in which animals exhibited these traits over 12 trial days. The progeny of the inbred emotional animals showed a continuous increase in incidence of the trait to the point where the animals were expressing it in 8 days out of the 12-day trial period. On the other hand, the non-emotional strain did not clear up much in successive generations. However, they

were already at a low level where they were exhibiting the trait on only one day of the 12-day test. These results add conviction to the belief that the trait certainly has an hereditary basis. In the light of the work identifying the genes for temperament and coat color, mentioned above, it would be interesting to see the results from the open field tests on varieties of pigmented animals.

f. Handedness has been reported for seven generations of inbreeding, crossing right-handed animals with right-handed litter mates, and likewise left-handed animals with left-handed litter mates. Since this report, the work has been carried to the tenth generation without any noticeable clearance in the lines. That is, the right-handed line continued to have about as many left-handed offspring as right, and the left-handed line likewise. As compared with a number of the other characteristics mentioned above, we have here what seems to be a relatively simple expression of a trait. Nevertheless, it has an aspect of complexity which may make it more involved than that of brightness and dullness, seizure behavior, or emotionality. Animals are not necessarily consistent in the expression of handedness from one situation to another whereas in the other behavior traits mentioned they might be expected to be. Another attempt was made to inbreed ambidextrous animals, but by the fourth generation the line had bred out so that inbreeding could not be continued. The results of this work have led to a very skeptical view of the easy generalizing that seems to be the rule concerning the inheritance of handedness in humans, as found in the literature. In the rat, the evidence is against its inheritance, and there is no evidence one way or the other in the human, though there is considerable rationalizing about it.

Maturation and Instinctive Functions. The earlier observations on growth and development have been summarized by Donaldson (8) and later observations by Nicholson (10). The regularity of such simple facts as the onset of motility 14 to 15 days after insemination, the constancy of the gestation period (normally 21 to 22 days) and later growth constancies such as eye and ear opening, and, within wider limits of variation, of sex behavior, bespeak of lawful control, but these statements of regulation are for the present largely empirical formulations outlining the facts. Coghill's (7) prin-

ciples of differentiation of smaller behavior segments from a larger more generalized mass, of cephalo-caudal and proximo-distal directions of development seem to apply with some modifications to the rat. Whether the regulatory mechanisms are of the nature of metabolic gradients (Child) operating under remarkably constant environmental conditions, or the operation of genic hereditary principles of sequential unfolding with each stage depending on conditions determined by its predecessor, or an interaction of these, has not been determined. Considering the inaccessibility of pre-natal material and the difficulties of control either of physiological gradients or of genic interactions, perhaps the student is expecting too much in suggesting that the mechanisms regulating growth phenomena should be understood.

In the main, a great deal of effort must be expended and no little ingenuity applied to obtain even modest results. Thus, careful study of fetal development to tactual stimulation found a progressive individuation of responses with increasing fetal development and age, suggesting a maturation through normal growth processes of tactual space localization, rather than a learning process in the early primary patterns of spatial perception. Nevertheless, satisfactory controls could not be instituted to answer whether the behavior in question matures or is learned, or whether in fact there is a distinction between the two with respect to such phenomena.

With reference to post-natal behavior, that aspect which has received the most detailed and precise description and experimental investigation has been sex and reproductive behavior, including, in the female, such related phenomena as parturition, nesting, care of the young, and the like. Munn (25) has summarized the early studies; Stone (1) includes more recent studies; and Beach (2) the nervous mechanisms involved. The behavior appears to be under the control of the hormones, especially of the gonads and pituitary. Learning, on the other hand, plays a very minor, if any, part and for this reason it seems appropriate to designate the behavior as instinctive.

The normal male rat reaches sexual maturity at an average of 65 days of age, but copulatory behavior may occur earlier, especially under optimal conditions of nutrition, etc. After maturity is reached, a few animals may not show

copulatory behavior. Castration of pre-puberal animals prevents the occurrence of the behavior. Castration of older, sexually experienced animals results in a gradual waning of the behavior, although some animals may continue to copulate for some time after the operation. Injection of androgens (e.g., testosterone propionate) in normal prepuberal males hastens the development of the behavior. Similar administrations in the prepuberal castrates will initiate the behavior, and in experienced castrates in which waning has occurred, will reawaken it. Animals reared in isolation beyond puberty will show copulatory behavior, upon opportunity with receptive females, about as well integrated on the first occasion as on later occasions or as compared with experienced animals.

In female rats copulatory behavior is correlated to the estrous cycle and occurs in conjunction with ovulation. Young animals reared in isolation until estrus occurs, show similar, fully integrated behavior without the necessity for practice. Ovariectomy abolishes estrus and the administration of estrogens reinstates it and also the copulatory behavior characteristic of estrus. Administration of the hormone in prepuberal females likewise hastens the development of estrus and of copulatory behavior.

Reversals in sex behavior are known to occur. Thus some males will show the receptive behavior, including lordosis, of the female, and some females will show mounting behavior and pelvic thrusts typical of the male. The latter can be accentuated by the injection of testosterone propionate. The hormone injections also increase aggressive fighting and produce anatomical changes such as hypertrophy of the clitoris. The former is likewise increased from the administration of estrogens. It would appear that both male and female behavior patterns are latent in each sex and are normally under hormonal control.

Recent motion picture analysis at sixty-four frames per second indicates the complexity of copulatory behavior and the temporal relations involved in the activity. Non-ejaculatory copulations extend from one-third to two-thirds of a second and elicit an average of 5.6 pelvic thrusts, while ejaculatory copulations extend from 1 to 4 seconds and average 10.7 thrusts. In the same study, three-hour tests gave saturation in about half the animals studied (35

males) with highly variable profiles of copulatory activity during this period, raising the question of the validity of short test periods—for example, 20 minutes—in studying the strength of the drive. Recovery after satiation proceeded at a rate slower than 24 hours and may extend to 4 or even 6 days.

Stone (1) has stated, "The hormones from the gonads appear to be the *sine qua non* for the organization of sexual behavior" (p.1218). But Munn (25) would add, "However, the mere existence of a physiological stimulus not derived from the environment outside of the animal does not explain the pattern of the sexual response." So far as is known at present, the neural mechanisms controlling sex behavior have not been localized. Even if a hypothalamic center were to be isolated, the cerebral cortex plays an integrating part. Cortical destructions up to 50 per cent of the total area in prepuberal males is ineffective in disrupting later sex behavior, and Stone suggests that more of the cortex could probably be removed without effect. However, Beach has since reported certain qualifying differences from extensive destructions in sexually vigorous animals. If the behavior was not interrupted after cerebral destruction it exhibited essentially the same pattern as in the normal animal. But extensive destructions (up to 75 per cent of the total cortex) seem to reduce the possibility of the expression of copulatory behavior. It is as if the threshold of response had been increased by the ablations. Similar results are obtained from sexually inexperienced animals.

Similar but not exactly parallel results are found in the female. Extensive cortical destructions do not affect female copulatory behavior—at least, such animals can and do bear young. But other aspects of maternal behavior are affected. After removal of 80 per cent of the cortex, animals copulate and bear young. Destructions of 30 to 50 per cent of cortical tissue interfere with nesting and care of the young, and destructions from 65 to 80 per cent result in abolishment of adequate maternal behavior (parturition, nesting, and care of the young).

Lashley (16) has outlined four general possibilities as to how the hormones may influence the *patterns* of behavior to bring about sexual activity. (a) They may stimulate the growth of specific processes, like chemical organizers. (b) They may increase the general excitability

of the organism. (c) They may operate on specific peripheral organs, which in turn inaugurate the patterns through the afferent supply. (d) They may act directly (interstitially) on central patterns already laid down (through heredity, maturation, or both) to increase their excitability. After citing the evidence for and against each possibility, he is led to favor the last, although admitting that the evidence in favor of it is indirect.

SENSORY AND MOTOR PHENOMENA

In a sense all we ever study is animal behavior, so that everything falls under a general heading of motor phenomena. Such a point of view, however, does not make distinctions which are commonly accepted and seem reasonable. When we study discriminative behavior we are not interested in the animal's locomotion as such, but in the fact that he distinguishes between two different situations. If these differ on the stimulus side, for example, one being light and the other dark, we infer that the animal is making sensory discriminations. He could be reading the experimenter's mind, but since extra-sensory processes have not been established and since the behavior breaks down when the differences are equated for light, we draw the easier and more obvious conclusion.

As Kreezer (10) points out, three types of methods are available for investigating sensory capacities in animals: (1) the stimulus-test method, (2) the discrimination-response method, and (3) the conditioned-response method. In recent years most experiments have employed these methods more for some other purposes than to establish the sensory capacities, as such, of the animals. Reference has already been made to the study of fetal spatial discriminations which used the stimulus-test method. The ulterior purpose here, however, was not to discover if fetal rats possessed tactual sensitivity, but to investigate how its tactual perception becomes spatially organized. Likewise, the conditioned-response methods have been used in the rat not to investigate the animal's ability at sensory discrimination, but largely to see if the concepts growing out of the work on conditioning in other organisms hold for the rat. In fact, much of it can almost be said to be less than that. In 1933, Munn was able to say that the conditioned *reflex* method had not been used on rats. Since then the main objective in

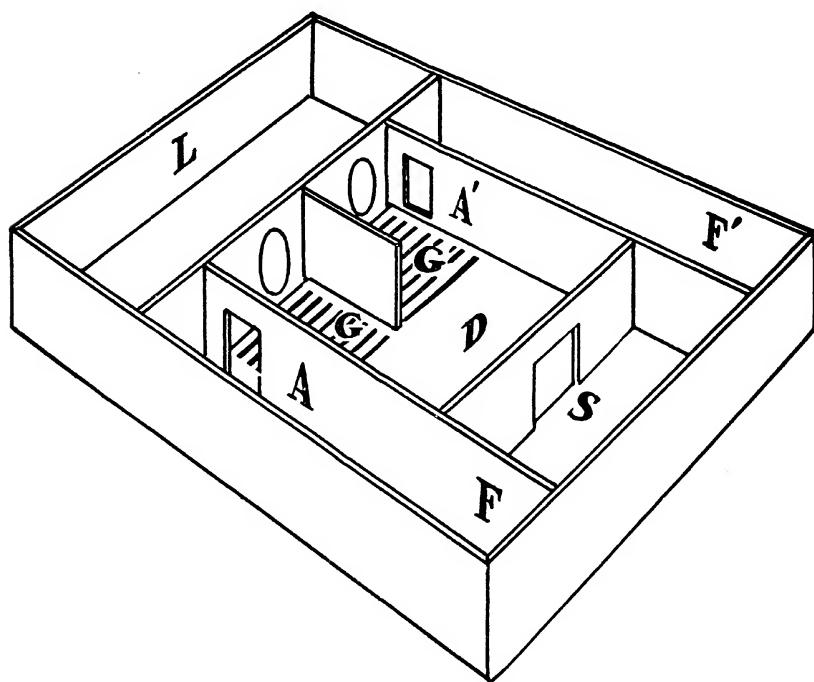


FIGURE 5—Yerkes Brightness Discrimination Box. L is the light box. The animals are started at S, proceed to the discrimination chamber, D, thence cross grids G or G' through the entrance, A or A', to the food box, F or F'. Redrawn from K. S. Lashley, *Brain Mechanisms and Intelligence*, Chicago, The University of Chicago Press. By permission of the publisher.

conditioning work on the rat has been to show that precise, definite, conditioned *reflexes* can be established in this animal. A conditioning of less specific and precise reflexes, of what has come to be called conditioned *responses*, have been studied with reference to problems of learning, but not for purposes of investigating sensory acuity.

Information regarding the sensory acuity of the rat is thus obtained largely from the discriminatory-response method. The apparatus used is some convenient form of choice box, adapted to the particular conditions to be studied. The earliest and perhaps best known of standardized apparatus is the Yerkes brightness discrimination box (fig. 5). It consists of a starting chamber and discrimination chamber where the stimuli are presented, followed by two paths, one leading to the correct choice (food

is usually the reward) and the other to the incorrect choice (electric shock is frequently given as punishment, although delay in reaching the reward can be used). In work on brightness discrimination, the correct path is determined by a random order which prevents solution by adopting a position habit or any other "hypothesis" than the difference in light intensity. It is this apparatus that was used by Lashley in his early studies of cerebral mechanisms of vision in the rat.

The Yerkes box can also be used to study size discrimination. It is not suitable, however, for studies of figure discrimination, and for a long while it was believed that the rat was quite deficient in this respect. However, in the late 1920's Lashley devised his now well-known jumping technique (fig. 6), which clearly showed that the rat has considerable capacity

for such discriminations. This apparatus requires the animal to jump from a platform through stimulus cards to another platform containing a reward. If the correct (positive) card is selected, it falls in onto the reward

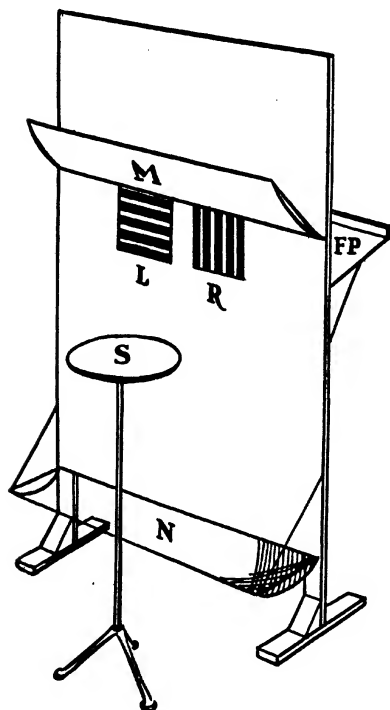


FIGURE 6—Lashley Figure Discrimination Apparatus. The jumping platform is at S, the food platform shown at FP, with discrimination patterns shown at L and R. M prevents the animal from jumping too high, and N is a net to break the fall in case the wrong choice is selected. Redrawn from *J. Genet. Psychol.*, 1930, p. 454, by permission of the publisher.

platform from the force of the rat's jump, and the animal lands on top of it on the platform. But the incorrect (negative) card is securely fastened and does not give way when the rat hits it. Consequently the animal falls into a net below. Similar alternations in position of the cards are used to those given in the Yerkes box. The advantages of the apparatus over the Yerkes box are that the stimuli are so presented as to attain greater attention from the animal at

the time of choice and the punishment, bumping and falling, follows immediately upon the incorrect choice and yet is not as disruptive apparently to the adaptive behavior called for as strong electric shock can be in the Yerkes box. Some difficulty is encountered in getting the animals to jump, especially on difficult discriminations. Tapping the animal on the back or tail, air blasts and electric shock have been given on the jumping platform. While these might result in cues, careful controls indicate that the animals discriminate on the basis of the visual differences presented. The comparative ability of albino and pigmented animals has already been given in the preceding section.

With this apparatus Lashley has studied the details of cerebral control for pattern discrimination. The results indicate a higher degree of control by the cerebral cortex than for brightness discrimination. Animals may learn brightness discriminations as rapidly without the visual cortex as normal animals, whereas destruction of the visual areas abolishes pattern discriminations. In recent years Lashley has been interested in what he terms "conditional reactions" (17). After considerable training, the animal is required to select the correct pattern in terms of the background on which it appears. Thus a white triangle may be positive and a white cross negative on a black background. On a black-and-white-striped background the situation is reversed. The triangle becomes negative and the cross positive. The animal is trained until he reverses his choice automatically, and immediately, depends on the background. Lashley believes this reversal involves a higher degree of integration than that for the discrimination of visual figures. A study of the cerebral mechanisms involved indicates that a visual association area or other integrating region than the primary visual cortex is unnecessary to the successful performance of the act. In the rat, Lashley has been unable to distinguish anything comparable to a visual agnosia or amnesia as found in man after cerebral loss in regions immediately surrounding the striate areas. It has led him to the belief that one of the primitive basic functions of the organized nervous system is to mediate generalizations of this sort and that "trans-cortical association" is unnecessary for their proper functioning.

Work with the other senses—for example,

audition, olfaction, etc.—is likewise interesting mainly with reference to the neural mechanisms involved. Other than this the studies have shed little light on the nature of the processes in themselves. Thus the rat can make auditory discriminations based on noise versus silence and is abnormally affected by high-pitched sounds such as key jingling, hisses from air blasts, etc., and can make gross tonal discriminations put out by a loudspeaker from an electric oscillator, but these discriminations are not highly refined. This conclusion should be accepted cautiously, however, in view of our experience with visual figure discrimination. New methods and different apparatus may give more striking results regarding tonal discrimination. In auditory discriminations, the cerebral cortex seems to function much like the visual area for brightness discriminations; large destructions may abolish the habit, which may be reacquired in the absence of the auditory area.

Incidental observation of the rat sniffing about in his home cage or any strange situation would lead one to suspect that the animal utilizes his sense of smell considerably. Indeed, early studies indicated that the animal was assisted in learning mazes by odor trails. However, olfactory discrimination habits involving choices similar to those in vision are not easily acquired, and are subject to criticism regarding the adequacy of control, especially with respect to eliminating the possibility of the taste sense. Recently a discrimination apparatus depending on a food-reaching response has been described. Animals were able to make olfactory discriminations in a way which apparently precluded the possibility of gustatory discrimination. The most significant fact from studies of the neural mechanisms of olfaction is that small, intact remnants of the olfactory bulb are sufficient to carry out discriminations. Destruction of the bulbs must be complete to insure abolishment of function.

Work on the other senses, especially cutaneous and proprioceptive, have been largely concerned with their role in maze learning. For proprioception *per se*, inclined planes have been used. The rat can discriminate relatively fine differences of inclination (approximately 4°). With lesser differences the discrimination becomes progressively more difficult, but some animals can continue to discriminate differences

of 1° in inclination. Other methods have been devised to test the rat's ability to make assorted specialized sensory discriminations—for example, temperature discrimination, visual depth discrimination, etc. In the latter case, animals reared in the dark can make immediate adjustments to various distances, suggesting an integration of organization without need of visual space experience. Except for this kind of study, little work has been done in recent years to add to the general conclusions from such studies that the animal possesses some ability along these lines.

Studies of gross motor phenomena fall under the head of general activity. The most popular apparatus for such work is the revolving drum, although other activity cages suspended on rubber tamboours and recording on a smoke drum have been used. In the revolving drum the record is the number of revolutions made as a function of time. A great many conditions are known to influence this spontaneous activity and are summarized by Munn (25). The major influences are both external and internal, some associated with changes in the environment—for example, light and temperature—and some with conditions involving the general body processes and well-being of the animal—for example, hunger, sex, fatigue, and influences regulated by the endocrine glands.

Special motor phenomena include varieties of integrated responses, such as jumping, swimming, coordinated walking on a narrow pathway, preferential handedness, and the like. Since jumping is called for in the Lashley figure discrimination apparatus, such discrimination habits may be disturbed by cortical destructions which interfere with coordinated jumping without disturbance of visual ability as such.

The frontal regions of the brain are concerned with the control of these motor coordinations. Electrical stimulation of the frontal areas of the rat's brain produces movements on the contralateral side of the body. Although there is not the degree of differentiation found in species with more highly developed brains, there is considerable refinement. Thus local areas control fore and rear limbs, head, neck, etc. Within the forelimb region extensor thrusts can sometimes be elicited rather than flexions or salute movements. The area is so small, however, that these different movements cannot be obtained by differential exploration within

the same animal during a given observation period.

The most precise localization of motor function has been reported for handedness. Destructions amounting to one per cent of the total cortical area, and even less, interfere with the use of the forepaw in preferential handedness. These results do not conform to the recent popular interpretation that adjacent regions contribute to the function, with degree of loss proportionate to the extent of destruction in this general region (21). They do, however, conform to the more recent interpretation of Lashley regarding the visual area and trans-cortical regions described above. This precise, localized region is prepotent for the control of preferential handedness. Sub-cortical, trans-cortical and cerebellar mechanisms contribute nothing directly and little indirectly to the control of the function. From the results so far obtained the evidence seems to indicate that any change in handedness would be found in this localized pool of motor neurons controlling this function in the frontal areas of the cerebral cortex rather than in any other central mechanisms. Changes can be effected, for example, by arrangements which will lead to practice in the non-preferred hand. After considerable practice of this sort, some animals show transfer of preferential use when returned to the normal situation. Similar changes have been reported from the application of certain drugs—for example, acetylcholine—to the *homolateral* frontal area, but the results have been somewhat equivocal up to the present.

MOTIVATION AND EMOTION

Since Thorndike's statement of his laws of learning, motivation has come to occupy an increasingly important position in psychology until today it is a central concept (22, 14, 24), yet it is a curious fact that psychologists do not know, or at least are not agreed upon, what they mean by motivation, and the operational point of view, as in most of their broader concepts, does not give them much help. Young (40, p. 87) cites six common points of view regarding motivation: (1) It may be looked upon as a stimulus—physical energy which excites receptor or nerve cells. (2) It may be regarded as a chemical state, like thirst or fatigue, regulating the excitability of cells. (3) It may be a determination to act, an intention, or set,

initiating and channelling bodily movement.

(4) It may be looked upon as a tension or force, driving the organism, e.g., libido. (5) It may be related to the doctrine of psychological hedonism which holds that pleasantness and unpleasantness are human motives. (6) It may refer to external situations which arouse action.

The first two views are more common than the others among animal psychologists, and if we say, operationally, that motivation is what psychologists study when they say they are studying motivation, and thus try to abstract the definition from what was done in the laboratory, no one of the definitions fulfills all the requirements. According to Stone (1), "the term *sexual drive* is generally used in comparative psychology to denote aroused action tendencies in animals to respond to objects of their external environment that, in some measure, lead to the satisfaction or alleviation of dominant psychological urges associated with reproduction. Strength of drive is expressed in quantitative terms that describe sexual activities with respect to frequency of occurrence, vigor and persistence, or some other aspect that conveys the idea of quantity or magnitude" (p. 1213). But Skinner (29) regards drive as a hypothetical state between operations and behavior not *necessary* but useful in a descriptive system. It is an organic state affecting reflex strength without altering "reserve" and it is not thus a stimulus. There is no drive for pupillary contraction, since this behavior is relatively invariable. Presumably this view would likewise rule out any drive for the need for oxygen, since reflex breathing is likewise relatively invariable, and ever present. If you look upon hunger as interoceptive stimulation due to stomach contractions, it is difficult to account for the continuation of eating when the contractions cease or at least have been reduced by the first early ingestion of food. According to Skinner, there is not a single hunger, but a series of sub-hungers, akin to appetite, and an animal will proceed with the eating of one kind of food when another has been fully satiated. Although no such sub-appetites for sex have been demonstrated, they would probably be found under proper circumstances. Some psychologists distinguish on a stimulus-response basis between motivation and emotion. Thus emotion is a variety or form of response, while motive or drive is a form of stimulus. For Skinner, how-

ever, emotion is a change in reflex strength brought about by certain types of operations, and, he mentions, there is frequently a thin line of distinction between drive and emotion.

Warden, et al. (36, p. 219), list five methods for measuring drives: (1) general activity method, (2) choice method, (3) resistance method, (4) obstruction method, and (5) learning method. To these can be added what might be called, for want of a better name, the direct method. General activity has been previously described in another connection. The learning method has been criticized for being complex and unsuited to drive measurement. Thus Stone (1) states "the technique is poorly suited to the comparative study of optimal learning rates, because a well-nourished male that has suffered little food deprivation, although manifesting a strong sexual drive, is sluggish on the maze. Likewise, a female that is drastically deprived of food fails to come into heat. At best, the technique has little promise of fulfilling the major desiderata for studies of sexual drives" (p. 1249).

The choice method used, for example, by Tsai in his study of the relative strength of the sex and hunger drives in rats uses a maze-like compartment with two alleys, one leading to each incentive or goal (fig. 7). As he employed it, the method has been subjected to considerable criticism, largely through failure to exercise sufficient control of the strength of each drive at the time the comparisons are made, but a rerun under better control gave essentially similar results, indicating a much greater choice of food over sex by the rat under these circumstances. The criticism that the method complicates the study of drives by taking two at a time seems beside the point. All methods are complicated by an additional variable, the obstruction method, for example, by punishment with electric shock. It involves the choice of punishment with reward to avoiding punishment without reward. Recently Skinner (29) has stated, "The simplest way to determine whether hunger is stronger than sex is to place appropriate stimuli for each drive before the organism at the same time. If it is argued that drives mutually influence each other, so that maximal degrees of two drives cannot exist at the same time, then the question of comparison is academic and may be passed by" (p. 403).

The resistance method and obstruction method

are very similar. In each case the animal is subjected to electric shock in order to obtain the incentive. In the first, the shock is increased until the animal refuses to cross the grid to reach the incentive. The strength of shock is taken as a measure of the strength of drive. In the second, a constant strength of shocking current is used and the number of crossings in a standard interval of time is an index of the strength of drive.

In the early work with the Columbia obstruction box (fig. 8), the method gave great

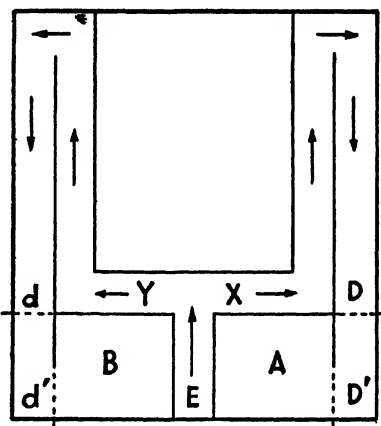


FIGURE 7—Floor plan of the choice apparatus, used by Tsai. The animal is started at E, with incentives at A and B. The choice is selected at X and Y, with control doors leading to the incentive at D, D' and d, d'.

promise of systematizing the entire subject of motivation. It appeared that the standardization in terms of number of crossings to a constant shock under different motivating conditions and appropriate incentives gave directly comparable measures. Thus it would be possible to rank the order of strength of various fundamental drives. Thirst was stronger than hunger, which in turn was stronger than sex, and all were stronger than "curiosity," an opportunity to explore, in the rat. The finding that the maternal drive was the strongest of all was stated with some reservation, since it depended upon a preliminary investigation based on a small number of cases. The hunger drive increased in strength with food deprivation up

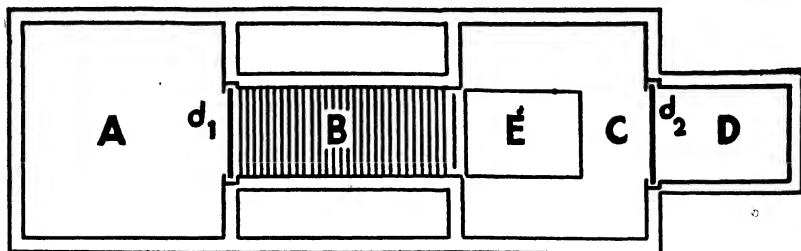


FIGURE 8—Floor plan of the Columbia Obstruction Box. A, entrance compartment; d_1 , door leading to B, obstruction compartment with electric grill; E, release plate for door, d_2 , to incentive at D. Redrawn by permission of the publisher. From Warden, Jenkins, and Warner, *Comparative Psychology*, Vol. III, p. 343, New York, The Ronald Press.

to two days for females, and four days for males, after starvation, whereupon it decreased in strength. Likewise, thirst reached its maximum strength one day following water deprivation and decreased in strength thereafter. The male sex drive was strongest 24 hours following copulation and gradually decreased thereafter to 30 days later, as long as the tests were conducted, but the strength of the female sex drive followed the estrous cycle of the animal, independently of satiation following copulation. Early criticisms of such conclusions concerned the interval of time selected to run tests. A 20-minute interval had been selected, and the number of crossings in this time measured the strength of the drive. The original experiments indicated less clear-cut results when approaches or contacts with the electrical current were used instead of actual crossings, but further analyses revealed that different time intervals gave different results, so that the conclusions were a function of the intervals used.

More recently, direct measurements have failed to confirm some of the findings of the obstruction method. Direct measurements have to do with the observation of the actual behavior concerned with the drive in question. For sex it would be copulation; for hunger, eating; and for thirst, the drinking of water. We have already seen that observations of copulatory behavior in the male rat over a three-hour interval required some four days before recovery to complete strength occurred, a figure at variance with the 24-hour recovery period reported for the obstruction method. Skinner (29) worked with the hunger drive as meas-

ured by the strength of the "reflex" which resulted in feeding. In comparing his results to the obstruction method, Skinner writes:

"When the individual curves are averaged, the resulting curve closely resembles that of Warden and Warner, except that the peak comes slightly later. But this averaged curve differs in two important respects from the individual case: the increase in hunger is slower and the final drop sharper in the individual curve, and the height of the peak is greater. Both results follow from the fact that different rats reached peaks at different times. If this was also true, as is probable, in the Columbia experiments, the curve there obtained does not clearly represent either the course of the change in hunger or the maximal value attained. Some of the rats that were starved for four days had probably reached their maximal drive before the test period, and some certainly reached it afterwards. The fourth day happened to catch more rats at or near their maximal drive than any other period used. In the present experiment the animals reached peaks anywhere from the fourth to the thirteenth day of starvation. The mean is at 7.3 days and the median is at 7. By averaging the rates for all rats a peak at five days is obtained" (p. 404).

Enough has been outlined above to indicate that no definition and no one's point of view will be acceptable to all others. In fact, there is enough diversity of views to lead one, unless he is himself concerned with a systematization of concepts, to consider rejecting all concepts of motivation, following the Skinner suggestion already referred to consistently to its ultimate end and study behavior under specialized oper-

ational conditions. If this were done, however, one has the feeling that the concept would probably be conveniently reintroduced when certain types of phenomena were considered, perhaps under a new name, as was done in the case of instincts. In fact, instincts themselves came to be considered as drives, needs, urges, etc. A better procedure would be to recognize a multiplicity of circumstances that would make convenient the acceptance of different conceptions of the nature of motivation, depending on these conditions. At one time it would be convenient to regard the concept as referring to chemical changes producing dynamic effects of a restrictive sort on the nervous system. At another, as external stimulation, a stimulus producing persistent behavior in the organism. Again it could be, following Woodworth's point of view, the influence of activity in progress on subsequent activity, and so on. Fortunately the animal psychologist is spared the need to concern himself for the present with its conscious and unconscious aspects, apparently of great importance to the abnormal psychologist.

A significant contribution to the concept of motivation has been made by Richter, summarized in a recent article (27). His concept is based on Bernard's constant internal environment—an optimal environment for the habitat of living cells, and Cannon's conception of homeostasis. While these men were concerned with the regulation by parts of the organism in maintaining optimal conditions, Richter studied adjustments by the total organism to do so. Thus animals deprived of certain regulatory organs—for example, the posterior pituitary, the adrenal cortex, the thyroid, parathyroid, etc.—responded by an increased ingestion of proper substances to make up for the resulting losses. A striking example is seen in adrenalectomized rats. The sodium metabolism of such animals is completely upset and enough salt is lost through the urine to result in death in a few days. If such animals are given access to 3 per cent solutions of sodium chloride in their tap water, they will increase their intake of it to 10 to 15 times that of normal animals. Along with the increase in demand for salt is an increase in receptivity of the taste buds. Normal rats could detect, by preference tests, one part of salt in 2,000 of water. Adrenalectomized animals were able to detect one part in 33,000 of water. When the afferent nerve supply to

the taste buds is cut, the animals no longer show the increased salt consumption but die.

At first glance these results conform to a chemical theory of motivation and the specific instances cited by Richter certainly fit better here. Of greater significance is the point he makes that drives are created to maintain optimal living conditions. There is no reason to limit them to chemical changes in the organism. One can be physical, another chemical, a third act directly on established central mechanisms, etc. All are functions of complex physico-chemico-organic conditions within the organism. It is hardly to be expected that the complexity of interactions of androgenic substances acting directly through the bloodstream on neural structures would give as clear and simple a picture as changes in pH on localized bulbar structures in the regulation of breathing. In the first case one would expect widespread effects—for example, on the cerebral cortex—to furnish a basis for the contribution of this organ to sex behavior. Some such analogous functioning can be looked for, but awaits future research.

Studies of emotional behavior in the rat have been confined largely to tests which differentiate degrees of timidity, wildness, aggressiveness, and the like. They have not been concerned with the kind of work that is thought of in connection with Cannon's contributions to the subject of emotion. Other types of animals have been used to study autonomic and hypothalamic mechanisms in emotional behavior. In the rat work, the terminology employed is even less settled than for motivation, where at least there is some agreement that the primary biological drives—hunger, thirst, sex, etc.—though possibly interrelated, are distinct enough to be designated separately. A recent summary of the work on the rat has been given by Hall (11).

LEARNING AND THE HIGHER MENTAL PROCESSES

Measured in terms of number of papers or of time devoted to discussion of concepts, learning is unquestionably the most important topic in twentieth-century animal psychology. Since the time of Thorndike's early study up to the outbreak of the recent war, this topic may be said to have dominated the literature. Only in recent years has there been a comparable rise in interest in another subject, namely, abnormal

behavior. Whether this is a sporadic interest or will continue to grow in importance will be determined in the future. Since it is the subject of a special review in this series, the evaluation of its importance will not have to be considered here.

The literature on learning is so vast it would be impossible to do any kind of justice to a survey of it in this summary. Under these circumstances, it is not surprising that there is no accepted comprehensive definition of what is meant by learning. If learning is what psychologists study when they perform learning experiments, then there is no one learning, but learnings, since they perform many distinct kinds of experiments. The psychologist may hold to the faith that these may be reduced to a single fundamental kind of process, but he has failed thus far to convince his co-workers either of this fact or of the nature of the process if there is only one. One might speculate as to what kind of process might lead to such a conviction, at least for a majority of psychologists. A naive attitude would probably select a fundamental neural process. Skinner (29) has argued convincingly against this point of view, and insists that a science of behavior not only can but must stand on its own feet. Yet with the errors in measurement so inevitable in as variable a phenomenon as a living organism, it is difficult for the present-day student to envisage the time when different methods of investigation can be so well correlated as to indicate a fundamental behavior process in operation. Skinner does not deny the importance of neuropsychology, but questions its significance for the problem considered here. He insists that this solution will be found in behavior studies *per se*, not through correlation to underlying neural structures. I presume if the neuropsychologist succeeded in unifying behavioral phenomena by showing its dependence on a fundamental brain process, Skinner would accept the result as a discovery of the first order, but would expect the behavioral inter-correlations to have predicated such a discovery in the first place.

An empirical approach to the subject of learning can be found in McGeoch's *The Psychology of Human Learning* (22). Although, as its title implies, its primary concern is not with infra-human learning, it does refer to some animal work, especially on the rat, and its statements are general enough in their scope

to be a valuable summarization of the principles of learning for animal as well as human subjects. Hull's *Principles of Behavior* (14) presents his well-known hypothetico-deductive approach to the same problems which concern McGeoch. He gives more data on and greater emphasis to animal studies, although the material is confined largely to those studies, mainly from his own laboratory, which fit into his system. The two texts furnish a good comparison for the student wishing to begin his own organization of the subject. Other contemporary points of view are to be found mainly in the journal articles.

For the purpose of getting a start in our discussion, studies of learning may be roughly divided into two classes: (1) Those concerned with factors or conditions which influence the learning process, and (2) those which are primarily designed to shed light on the nature of the process, i.e., theoretical studies. Yet it is true that many of the first kind of study frequently include an interpretation referring to the second type of study, and no sharp line of demarcation can be drawn between them. For example, in recent years few articles concerned with conditions of learning are content to leave the matter there. They almost always include an interpretative section which tries to link up the study with the fundamental nature of learning. Thus the study referred to under Methods (above), devised to separate the influences of practice and effect, includes a brief reference to the significance of these concepts for learning theory. Other recent studies—for example, of transfer of training, distributed practice, reminiscence, etc.—likewise include interpretations of significance from the standpoint of learning theory. On the other hand, for convenience alone, the conditions of learning may be studied without reference to their theoretical significance. Alcohol under intoxicating conditions may disrupt learning and the relation of dosage concentration to degree of disruption may be carefully outlined without reference to the laws of learning. That this may be due to the influence of the substance on some fundamental underlying learning process may be ignored if desired.

There is no agreed classification of the conditions which influence learning, the grouping of each author reflecting his own interests. In an outline of factors influencing the distribution

of errors and various blinds in the maze, Buel (5) listed a total of 93 factors under 13 rubrics. Kreezer's (10) outline divides the conditions into two large subdivisions: (1) biological, with five subheads such as sex and biochemical factors, with further subheads under these, and (2) psychological factors with 11 subheads such as sensory cues, transfer, etc. Tolman (33), though primarily concerned with theory, shows how the conditions affecting learning can be introduced into his schema as independent variables. These are grouped as (1) environmental, and (2) individual difference variables. Under individual difference variables are included heredity, age, previous training, and special endocrine, drug and vitamin conditions. He likewise introduces intervening variables—for example, demands, hypotheses, etc.—but the distinctions are made for theoretical purposes.

The following outline reverses the approach which would fit the conditions of learning into a theoretical scheme. Since theory is in such an uncertain state (disagreeable state, one is tempted to write, since there is so much disagreement among the theorists!) it would seem justifiable to fit it under a classification emphasizing the empirical conditions. Not all of these conditions are listed, but some of the major categories are subdivided further to show how the process can be continued. The only advantage in the present classification is its simplicity.

Learning may be studied as a function of:

- I. Methods of measurement
 - A. Practice
 - B. Performance
- II. The problem
 - A. Type
 - B. Length
- III. Subject
 - A. Species
 - B. Individual
 - 1. Heredity
 - 2. Age
 - 3. Sex
 - 4. Previous experience
(transfer of training)
 - 5. Motives and incentives
 - 6. Physiological conditions
 - a. Sensory
 - b. Motor
 - c. Neural

- d. Endocrine
- e. Diet
- f. Drugs

IV. Environment

- A. Wider sensory environment, as light, temperature, etc.
- B. Specific to the problem, as maze pattern, etc.

V. Method of learning

- A. Distribution of practice
- B. Guidance
- C. Part-whole

VI. Theoretical conditions

- A. Laws or principles
- B. Chance

A few words of discussion might be mentioned about some of these conditions. However, since not all of the conditions can be discussed without undue expansion of this article, omissions are inevitable and will occur either where brief reference has already been made (e.g., heredity), where little of recent interest in the topic has been shown (e.g., part-whole methods of learning), or where the literature is so great that a brief summary is impractical in a limited space (e.g., physiological conditions).

Method of Measurement. A good discussion of learning as a function of methods of measurement is given by McGeoch (22). He adopts the empirical attitude that there is no *one* form of learning curve, and uses a well-known example of measuring progress by two different methods to get, under the one condition, a curve with no acceleration and, under the other, a decelerated curve. He asks why one curve should be called representative of learning any more than another (p. 65). Nevertheless, having standardized the procedure and then obtained a given type of curve, it is in order to investigate further its basis. This is the case with those who study learning curve equations. A discussion of this subject and bibliographical material will be found in both McGeoch (22, Chapter 2) and Hull (14, Chapter 8).

Type of Problem. The question of type of problem and of species can well be discussed together. Evidently, with the wide variety of animal forms at the disposal of investigators, it is not to be wondered that many varieties of problem have been utilized and given to the animals to solve. Obviously a problem must be

selected that is within the possibilities of the organism's repertoire. The rat is so well adapted to maze learning that it cannot safely be said that, as far as this type of learning is concerned, he is inferior to man, but no one would seriously put him in the same class as man for this reason alone. Yet it is easy to assume that other species with less ability than the rat in the maze might be tentatively classed below him in the scale of intelligence because they fail to show equal maze ability. Animal psychologists with a phylogenetic bent, nevertheless, would like to develop such a scale. To include a wide variety of tasks to sample the repertoire for different species is almost an endless task, and even then the relationship of the problems to one another is not established to make comparisons possible. Warden's laboratory, where this attitude prevails, has tried to meet the issue with a specially devised technique that permits progressively more difficult problems of the same series to be set for the animal. The apparatus is called Jenkins' triple plate problem. (See fig. 9.) It is especially adapted to mammals. Results from it would place the rat below the kitten or monkey but above the guinea pig, in the particular ability tested by the apparatus, but it has not been demonstrated that the ability is any more general than the maze or other problem selected for some other specific purpose.

Motives and Incentives. Recent years have seen an increased interest in the influence of motives and incentives in learning. Motives refer to the conditions within the organism (e.g., hunger), and incentives to those goal objects (e.g., food) directly related to particular motives. Many psychologists have shifted their emphasis about these factors as a consequence of the relation of the factors to the law of effect or principle of reinforcement. Motives and incentives to them have become not conditions listed with a number of others such as drug or temperature conditions, but necessary conditions without which learning would be impossible. Thus a recent introductory text (28) in general psychology states that "theoretically, at least, it is quite clear that learning will not occur in the absence of a motive" (p. 293).

Statements like this may imply more than their authors intend, but their import seems to make something special out of motivation not

to be found in many of the conditions influencing learning. Of course, the saving phrase may be "theoretically at least." *Theoretically at least* many of the conditions of learning listed above are essential to the process. Thus one cannot have any learning without an organism, nor without a subject matter or problem. Likewise, some method of learning must be adopted; there must be some kind of distribution of practice, bunched or otherwise, in order for learning to

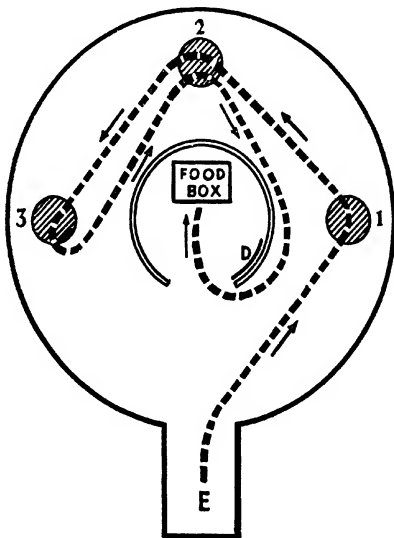


FIGURE 9—Floor plan of the Jenkins triple plate problem. Plates which must be depressed in proper order to open the door, D, are shown at 1, 2, and 3. The dotted line shows the path followed when the plates must be depressed in order 1, 2, 3, 2, to reach the incentive. Redrawn from Warden, Jenkins and Warner, Vol. I, p. 252, New York, The Ronald Press Co.

be possible. Even the temperature cited under environmental factors cannot be absolute zero (theoretically at least!) or there would be no learning. About the only thing unnecessary listed under these conditions is theoretical factors. You don't need to have a theory of learning to make learning possible.

What then is meant by emphasizing motivation in learning? There is the possibility that motivation permeates all through the process and may intervene almost surreptitiously when

other conditions are seemingly being investigated. For example, an early study of the effect of age on maze learning in rats indicated that efficiency increased with age to 75 days and thereafter decreased to the limits of the study. These and similar clear-cut results showing a superiority for younger over older animals have been criticized for failing to control motivation. It is argued that younger, growing animals are apt to be more strongly motivated by hunger, the motive usually employed in maze learning problems, than older, fully developed animals. Presumably, the degree of motivation should be controlled before results for different ages can be compared.

It has never been clear to the writer just what is meant by control here. It is suggested that maximal motivation should be employed. Why? Since we cannot measure motivation directly in individual animals under these conditions, who is to say that maximal motivation in 75- and 700-day-old rats are equal? Why should not normal motivation be selected, in the sense of the normal environment used in genetics and how are we to know if this is constant at different ages? Assuming that it is, are we sure this is what is desired? It would appear that analysis of variance offers the solution desired in this problem to separate the effects of motivation and age, providing that some standard method of measuring motivation is acceptable, e.g., hours of starvation. The experimental design could then test the significance of age differences after motivational differences are removed from experimental error. Until this is done, age can only mean, operationally, all the influences affecting an organism during time, including maturation, senescence, experience, *motivation*, and whatever else anyone can think of to include. Age is merely a convenient measure of the multitude of things that can happen during passage of convenient amounts of time.

At least this is an indication of one way of considering the ubiquity of the motivation problem, but this point of view would apply to any of the conditions above if enough were known of them and of their influences on the organism. Another type of consideration falls under theories of learning. In all likelihood most psychologists who emphasize motivation have in mind a particular theory of learning. In 1941, in a special Military Psychology number in the *Psychological Bulletin*, Mowrer (24) sum-

marized the present status of theories of learning, aiming to avoid controversial issues and to outline agreements among psychologists as a basis for concerted action in a national crisis. After quoting Thorndike's statement of the law of use and the law of effect, he writes:

"The Law of Use has been shown to be invalid. . . . The first half of the Law of Effect has become the basic formula for all learning. . . . Investigators who have largely restricted their study of learning to the development of anticipatory responses have, in general, accepted the 'association' theory of reinforcement, i.e., they have tended to assume that the active agent in learning of this kind is mere 'temporal contiguity' or 'paired presentation' of the sign (conditioned) stimulus and the signified (unconditioned) stimulus. It is true that temporal contiguity of the two forms of stimulation is a necessary condition for the occurrence of learning of this kind, but it appears not to be the sufficient condition" (pp. 424-426).

In favor of his point of view which gives fundamental importance to the law of effect in learning, he cites the advantage that this hypothesis considers learning "intimately related to the factors of motivation and motivation-reduction, a prerequisite of any theory that is to square with common sense and clinical observation" (p. 427).

Without desiring to reintroduce controversy where broad agreements are already established, but in fairness to the reader I cannot refrain from citing evidence from another leading psychologist who, curiously (from the standpoint of broad agreements!), is associated with the same university as Mowrer. In Murchison's Handbook (26), Lashley stated that "the law of effect confuses learning with performance," and "the evidence suggests that the drive is one of the associated elements in the maze habit rather than the agent responsible for the association" (p. 486). Later he wrote (19) that "Temporal contiguity is the only one of the 'laws' of learning which approaches universality. Not all simultaneous activities of the nervous system become associated, but apparently some temporal overlap is essential" (p. 317).

If there is one thing non-controversial writers would seem to be able to agree on it is that learning theory is the most controversial topic in the whole subject of learning. No review can hope to do justice even in outlining the points

of view. Peace makers who enter the subject in hopes of reaching a compromise or resolving the disagreements or confusion are apt to find themselves quarreling with each other over the nature of the difficulty. The best source of this confusion is the Psychological Review where a running account of the controversies is carried on. Until more agreement has been established, it seems appropriate to relegate the concept of motivation in learning to its proper place as one of many conditions influencing the learning process, not the *sine qua non* for all learning.

Theoretical Conditions. From a consideration of the place of motivation in learning we are thus led to the topic, *theories of learning*. From what has already been outlined the reader can expect not even an approximation to unity of opinion regarding theories. One would like to write that there are two or four or even a dozen theories, differing from one another in certain fundamental principles or in this or that detail, but such an attempt would be bound to overlook someone's valid point of view (from his point of view!). Only one thing can probably safely be said concerning classification of theories—there are some who are for and support a given theory and others who oppose it in one way or another. The statistically minded psychologists might wish that a record could be kept to see how the voting went on a given issue. Unfortunately many psychologists fail to register and are, therefore, unheard respecting their attitude, but if they could be aroused or required to declare themselves, this much could be asserted concerning the outcome. No theory would pass the 5 per cent level in acceptance as is commonly demanded in significance for experimental results. This is not meant to advocate that adequacy of scientific theory can be determined by unanimity of acceptance, but rather to emphasize the unsettled state of contemporary learning theory.

Of all theories, however, none would have wider acceptance probably, unless they be those centered about Thorndike's law of effect, than do those concerning conditioned reflexes, and some theorists have tried to combine them into a universal theory, for example Hull (14). For such theorists, conditioned reflexes are considered in one sense or another as the prototypes of all learning. The details can be traced historically beyond the terminology "conditioned

reflex" to British associationism, but will be ignored here. It was Pavlov who first employed the modern terminology, and who is accredited with the early objective studies of the phenomena. Later writers came to prefer the term "conditioned response" as a first step toward broadening the concept to include other varieties of learning behavior, e.g., what has sometimes been termed Thorndikian responses, which did not meet all the criteria of the relatively invariable, circumscribed, precise reflexes studied in physiology. Recently Skinner (29), who has no terminological inhibitions, has reintroduced the term reflex, applying it even to these Thorndikian responses and divorcing it from its neurological connotations. On the other hand, Tolman (33) would claim that Skinner's variety of response is not a reflex at all, and we can foresee the possibility of a terminological quarrel which would prevent the discussion of the phenomena and their significance for learning theory.

Extended treatments of the subject are to be found in Hilgard and Marquis (13) and Hull (14). Although both books are concerned very extensively with examples of rat learning, one is struck as a first impression with how little of the work deals with rat conditioning of the Pavlovian variety. Recalling Munn's statement in 1933 that the conditioned reflex method has not been used in discriminative learning in the rat, we may ask just what its status is for this animal.

In 1932 Warner reported conditioned *responses* in the rat. If the animal is placed in a box with two chambers divided by a partition that the animal can jump over to get from one chamber to the other, and if the box is wired to shock the animal, conditioned avoidance responses can be established. Warner points out that the established responses are quite different from early responses to the shock, but this feature has been reconciled by recognizing that the conditional salivary reflex is likewise not a replica of the unconditioned reflex e.g., in viscosity of saliva, etc. A variation of Warner's method has been studied in considerable detail by Hunter. Nevertheless, there may be enough difference in methodology in Pavlov's and Warner's situations to justify Woodworth's classification (39) into three types: (a) the conditioned response neither produces nor avoids the unconditioned stimulus (Pavlovian

variety); (b) the conditioned response escapes or avoids the unconditioned stimulus; (c) the conditioned response produces the unconditioned stimulus (pp. 102-107). An example of type (c) has been referred to above as the Thorndikian response, and is exemplified by the bar-pressing behavior seen in the Skinner box. Our question is whether the type (a) response has been studied in the rat. The closest approach to it is the work of Schlosberg et al., who have had moderate success (?) with eyelid, tail and foreleg reactions. Their chief finding, however, would seem to be that the rat represents a species for which classical or Pavlovian conditioning experiments are not very suitable. Liddell (15) has emphasized differences in animals to conditioning procedures, individual, race, and species differences, and the rat would seem to represent an extreme example of a species not very amenable to this "physiological" study of conditioning.

Only if we are ready to accept types (b) and (c) as instances of conditioning to which the general principles evolved from type (a) conditioning apply, can we accept a conditioning theory of learning. This has been most systematically presented by Hull (14). One is impressed, to say the least, not only by his rigorous, careful thinking on this subject, but also by the ingenuity of the experimental work carried on by his students in testing his hypotheses. Hull states the fundamental law of conditioning as follows:

"Whenever an effector activity occurs in temporal contiguity with the afferent impulse, or the perseverative trace of such an impulse, resulting from the impact of a stimulus energy upon a receptor, and this conjunction is closely associated in time with the diminution in the receptor discharge characteristic of a need or with a stimulus situation which has been closely and consistently associated with such a need diminution, there will result an increment to the tendency for that stimulus to evoke that reaction" (p. 98).

It will be seen that this is a double-barreled statement, including what was previously covered by the laws of contiguity and effect. Hull also gives a lucid account of the principle and its relation to contiguity and effect, especially in the notes at the close of chapters 6 and 7 in his book. The process is illustrated and described in fig. 10, taken from his book.

Hull's principles have been subjected to a searching criticism by Leeper (20). Since this in itself occupies 49 pages of print, I can only refer to his discussion of the principle that reinforcement is essential for learning. According to him, this principle is insufficient to account for the results of latent learning and differential motivation (pp. 35-38). Our purpose is achieved by illustrating differences of opinion on the subject.

It would appear that one's point of view and particular bias *before* he begins to study conditioning will determine his evaluation of the phenomena for learning theory. If he has a strong mechanistic-peripheralistic tendency plus a desire to arrive at some kind of simplification of an inordinately complex subject—even if this be somewhat in error—he will be favorable to the program. If he has Gestalt-configurational-perceptual or central trends or biases, he will be skeptical. The first type of individual will elaborate in great detail the mathematical symbols and exercise great care in drawing the deductions for further experimental work. The second will counter with: But don't forget to include in the equations a wide-awake, intelligent animal with an efficiently functioning nervous system. Empiricists—if there are any remaining after reading this far—will be ready to place theories of learning in a subordinate position among conditions of learning, as was done in this outline, and be content to conclude that for the present there are no established principles worthy of the name.

We have considered conditioning from the standpoint of its relation to learning theory. It should be pointed out that the phenomena can be studied without any such reference, and that many results can be obtained of great interest from other points of view. As an example of this the reader is referred to the work of Liddell, outlined in recent summaries (15, 23). He writes: "During the course of our study of conditioned reflexes, from 1927 to the present, I came to believe that Pavlov's method of the conditioned reflex could be accurately characterized as a method for producing the experimental neurosis" (15, p. 391), and has accordingly emphasized this point of view in his study of the phenomena of conditioning. His work, however, has not used the rat as a subject. Another investigator, Harris (12), has used the rat in a study of conditioning of Woodworth's type *b*, avoidance conditioning, with reference

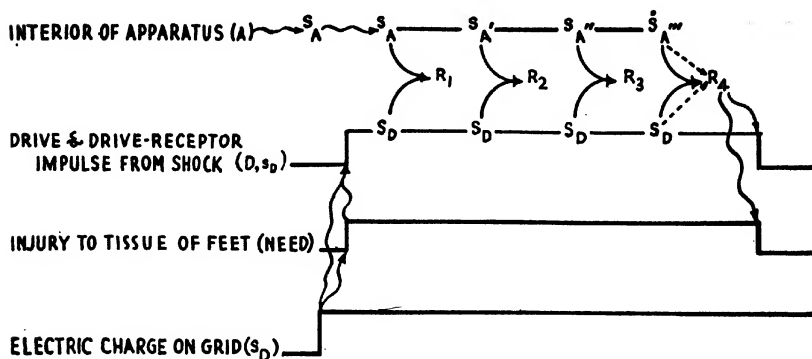


FIGURE 10—Diagrammatic representation of the process of strengthening or reinforcing the connections between $S_D \rightarrow R_4$ and $S_A''' \rightarrow R$. The step-like rises and falls of the several horizontal lines such as those of D and S_D , the shock to the tissue and S_D , represent the rise from zero and the fall of the respective processes. The arrows with wavy shafts represent a physical causal relationship other than by way of receptor-effector stimulus evocation. Thus the rise of the current on the grid (S_D) causes the shock to the tissue of the animal's feet, the response of the receptor in the skin (S_D) of those regions, and the drive (D) or motivation to action. The separation of the foot from the grid by the act of jumping (R_4) terminates simultaneously the injurious action or need, the receptor discharge (S_D), and the drive (D), though the current on the grid remains unchanged. It is the reduction in the drive receptor impulse (S_D) and the drive (D) which are believed to be the critical factors in the process of reinforcement. The arrows with solid shafts (\rightarrow), whether curved or straight, separate or jointed, represent receptor-effector relationships in existence before the learning process here represented occurred. The arrows with broken shafts ($-\rightarrow$) represent receptor-effector connections here in process of formation. Distance from left to right represents the passage of time. Description and figure taken from C. L. Hull, *Principles of Behavior*, New York, D. Appleton Century Co., 1943, by permission of the publishers.

to such concepts as habituation, pseudo-conditioning, and facilitation.

As opposed to the conditioned reflex analysis of learning processes one might outline the point of view of other psychologists, for example Tolman or Lashley. Although Lashley has never been primarily concerned with the establishment of a complete and consistent theoretical account of learning, the results of his experimental work, especially of the relation of brain processes to learning, has led him to be critical of the over-simplification which he feels results from conditioning or similar theories. He was largely responsible for the theoretical account outlined in Watson's early book (38, chapter 7), and his experimental program on the neural basis of learning was established to test the principles outlined there. These principles, of course, emphasized the factors of frequency and recency. In a controversy with Hunter over the interpretation of his experimental work, he has pointed out that it is as if he had diabolically planned to have the system tumble like a house of cards as a consequence

of his experimental results. Since then he has entered into the controversy on other occasions, for example, in his test of the "continuity theory" (18), and also in his criticism of Pavlovian cerebral theories. In a recent article (19), he points out how the Pavlovian theory of generalization based on nervous irradiation in the cerebral cortex fails to meet certain types of problem calling for explanation, for example the problems of stimulus or response equivalence. In this connection he outlines a suggestion of his own with a diagram in explanation of it (fig. 11).

"Visual fixation can be held accurately for only a moment, yet, in spite of changes in the direction of gaze, an object remains the same object. An indefinite number of combinations of retinal cells and afferent paths are equivalent in perception and in the reactions which they produce. . . . The first experience of a stimulus excites a certain number of neurons in a definite pattern (see fig. 11 bc-f). An associated reaction (y) is formed as a result of this stimulation. Thereafter, the excitation of any

LEARNING $b\ c\ \quad\quad\quad f\quad\quad\quad h\ i\quad\quad\quad l$
 TESTS . . . { $\quad\quad\quad c\quad\quad\quad e\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad k$

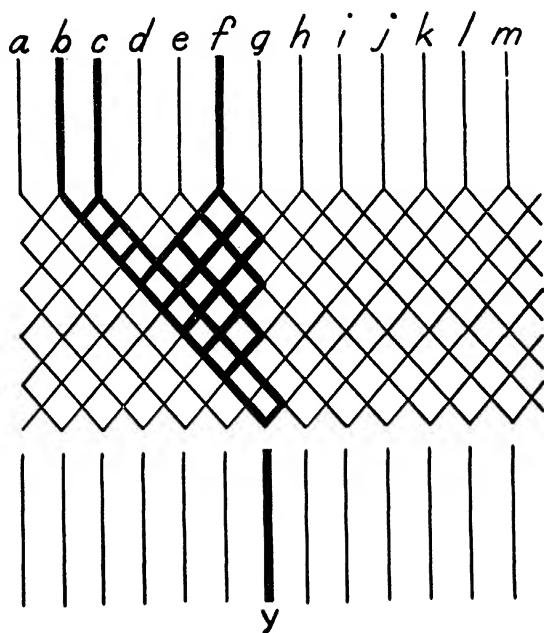


FIGURE 11—Diagram for the problem of stimulus equivalence. The response, y , is associated first with stimulus pattern $b\ c\ -\ f$, later with an equivalent pattern, $c\ e\ -\ k$. A fixed, localized trace, indicated by the heavy lines, cannot account for the reaction to equivalent stimuli. For further discussion, see text. From K. S. Lashley, "The Problem of Cerebral Organization in Vision," p. 305, in *Biological Symposia*, Vol. VII, Lancaster, J. Catell Press, 1942. By permission of the publisher.

similar patterns of neurons ($c\ e\ -\ k$) will elicit the associated reaction. The later stimulation need not, and practically never does, involve the original combination of sensory cells. It preserves only certain proportions or relations among the elements of the stimulus pattern" (pp. 304-305).

If it is assumed that a trace is left by the first stimulation to determine later reactions, the difficulty is to localize it. If it is localized in the neurons involved in the first reaction, they apparently do not need to be reactivated to elicit the same reaction. Hence Lashley suggests that the whole system takes on the influence of this trace, and it is the pattern, not the element,

that counts. Yet nerve impulses are transmitted over restricted paths. Their numbers can mount up to millions and more.

"The receptive layer of the visual cortex, in an animal even so primitive as the rat, contains half a million cells, all of which are subject to continuous excitation from the retina, and this half million serves only to initiate the chain of cerebral activities. In any such system the contribution of a single nerve cell can have little influence upon the whole. Behavior is essentially the statistical outcome of nervous activity" (pp. 310-311).

Is there a weakness in suggesting that there can be a first experience of a stimulus to excite

a certain number of isolated neurons in a definite pattern? This first experience may itself be a statistical outcome from a large number of variable elements, and in terms of the diagram ($bc-f$ arousing reaction y), the "visual" elements never existed except as a statistical outcome of neurological elements. When such diagrams are put on paper (for conditioning theories or any other theory), it is always implied that $bc-f$, or whatever symbols are used, stand for something in the way of an element. Thus b would be one rod cell in the retina with its connections, ultimately leading to y ; c is another rod cell and f still a third. From what is known of individual receptor cells and their activities, the time relations of the discrete activities of any single cell are so much smaller than the time relations of a "first experience" as to be of a different magnitude altogether. Thus the activity of cell b in accordance with the all-or-none law and the upper limit of frequency of nerve impulses, and likewise of cell c , and all others, are themselves statistical outcomes during "a first experience." One can be very sympathetic to his suggestion that the correlation of behavior to neural elements requires such a statistical analysis without requiring static neural elements with which to begin the analysis. In this way, an apparent paradox may be avoided. The system was in operation as a dynamic statistical flux before the rat ever looked at the triangle versus the circle to begin with, and when that "first look" came, it was imposed as further dynamic statistical events, upon some on-going processes in any specific cells, for example $bc-f$. The most completely systematic elemental approach to the subject would seem to be found in conditioned reflex theories as developed by Hull. If one has no faith in this, the most consistent alternative would avoid elementalism at the very outset. My own faith is that neurological omniscience would verify such a statistical analysis and as a consequence the problem of the fundamental nature of the learning process can be solved only by understanding the mechanics of the nervous system, only by knowing what goes on underneath the skin of the animal. Until this is realized, psychologists will continue to differ on the fundamental principles of learning, and no amount of careful, detailed studies which are restricted to the control of the environment will give us that insight.

Higher Mental Processes. Emphasis on what goes on underneath the skin of the animal deserves some support from behavioral studies. This can be found, I believe, in two directions: (1) a consideration of higher mental processes; and (2) laboratory experience in animal work. As to the first, what is referred to has been called by Heron (23) complex learning processes and includes insight, reasoning, delayed reaction, alternation problems, and generalizing, among others. Of these, greatest attention has been given to insight problems and the delayed reaction. The latter delineates more sharply than most of the others what is meant by "com-

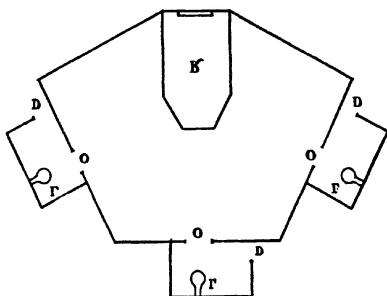


FIGURE 12—Floor plan of the delayed-reaction apparatus. The animal is restrained at R, while the light, L, shines through one of three openings, O, and food is at D. Only if the correct choice is made after the delay will the animal be rewarded with food. From F. A. Moss, *Comparative Psychology*, p. 258, New York, Prentice-Hall Co., 1942, by permission of the publisher.

plexity" or "higher mental processes." It could turn out, of course, that an understanding of the neurological basis of the reaction would indicate it to be actually simpler as to the essentials of its neural functioning than associative learning or the acquisition of an act or skill. Or it might be that these are all instances of the same basic mechanism, as most theorists are inclined to believe.

The delayed reaction was first devised to test for the possibility of ideas or, as they are termed today, representative factors, in animals. As originally performed, by Hunter, the animal is placed in a box with three compartments one of which contains food (fig. 12). A lamp in each compartment can light up the doorways and on any given trial only the one containing

food is lighted. The animal first learns to select the lighted compartment. The delay is tested by restraining the animal while the light is on and then removing this cue. If, after a lapse of time, the animal can still choose correctly, something must have functioned to direct him in the absence of the cue. This could be gross orientation or some other peripheral mechanism, but if these are ruled out, the evidence indicates some "central" factor is operating.

Early work suggested that the rat could not succeed without body orientation, but later investigations employing variations in method indicated some ability in this regard. Some authors, indeed, have reported delays of several hours, but their methods have been criticized as to whether they involved the essentials of a delayed reaction as outlined above. With other variations in method, 5-minute delays have been reported. Interruptions of peripheral orientation did not affect this ability, but small frontal destructions of the cerebral cortex seriously interfered with it.

It must be granted that the rat's ability in reactions of this sort is extremely limited, and it is probable that we are working near the upper limits of the animal's ability, as some writers have maintained. Animals higher in the phylogenetic scale show much greater capacities in delayed reaction tests than rats, and, as we ascend the scale, progressively greater capacity is shown, lending confidence to the presumption that the test is concerned with ideational or central representative processes. Nevertheless, the fact that the rat can perform successfully after short intervals of delay and that this success is not necessarily dependent on peripheral orientations, points to some kind of central control for this organism, as well as for higher animals. Its gross localization in the frontal areas of the cerebral cortex suggests that future investigation of the reaction should concentrate on this region rather than on peripheral or environmental areas.

Many criteria have been suggested for behavior characterized by insight. The more objective of these are frequently inapplicable and would sometimes fail to apply to some apparently valid instances of insight. To the writer insight has always seemed to be an anthropomorphic term. This is not meant necessarily to discredit the concept. It is easy to find instances of insightful behavior if one wants so to inter-

pret it. All he needs is a little first-hand laboratory experience with animals. If rats are trained in a latch box to press a lever opening the door of the food compartment, their early training looks like trial and error. As the training progresses, they show insight. For example, they will depress the lever, enter to the food compartment and begin eating. Then they will frequently stop up short, run back to the starting compartment, rise up on their hind legs, cock their heads, look at the lever, depress it a few times, in the meanwhile looking down at the door, perhaps depress the lever again, re-enter and eat some more, only to repeat the performance after a brief interval. During such performance, rats have an alert, intelligent look about them. Unfortunately, so does a spring robin looking for a worm. Perhaps they are both showing insight.

If the latch box is so arranged that the preferential use of the paws is employed, the skill of performance can be easily interrupted by a localized destruction of the contralateral frontal cortex. Then the animal will look up at the lever—intelligently, of course—but will be unable to manipulate it to open the door. Such an animal will usually transfer after some struggle to the other "hand" and thereafter increase his skill in manipulation. But if this circumscribed region is left intact but extensive destructions to the remaining cortex are made, the animal may not show very "intelligent" behavior. It wanders aimlessly about the confinement compartment, cleans itself, sits in a corner although hungry, looks through the door, etc. If retraining is resorted to, it might re-learn to open the box and does so with the hand originally used, and apparently with as much manipulatory skill as it previously showed.

Such differences in behavior from cerebral injuries are consistent with the distinction between learning and performance, a point of view which, though widely held, is not universal among psychologists. But it also illustrates the need for more information and better concepts before we can hope to understand the complexities of behavior processes. Only a little laboratory experience is needed to multiply instances of this kind. We may employ terms like attention, perception, comprehension, insight, but about all we mean is that we ourselves don't have much of it in our understanding of what is going on in an animal experi-

encing the "brave new world" given to it by experimentalists.

Recent years have shown an increase in interest in other concepts than learning and problem solving of the sort discussed above, where the rat has been used as a subject. Among these are studies of regressive and conflict behavior, examples of which can be found described in the articles by Mowrer and by Miller in Hunt's recent handbook (15). Many of the distinctions brought out in these studies are of great interest for the light they shed on these same concepts in abnormal psychology. Likewise, a recent study has shown that the rat is a suitable subject for certain varieties of cooperative problem solving and that two animals can work together to reduce the possibilities of shock when only one at a time can eat while avoiding the shock. Such work should likewise be helpful in shedding light on some of the concepts of social psychology.

While the outline given above has promoted an empirical point of view it has not been consistent. It has omitted many of the interesting empirical or experimental findings which have been made on the rat in recent years. The vast literature on this subject would have required a book of such summaries rather than an article. And if interpretations and evaluations of all of these studies had been included, this brief outline could have expanded into a set of volumes.

The literature in animal psychology will remain in its present somewhat haphazard and heterogeneous state until some more satisfactory general principles, especially as regards neural functioning, are discovered. It is unfortunate that this field is not in the position of some biological sciences, for example, heredity, which can offer a well-organized theoretical basis and present its experimental results around these principles. However, animal psychology is not alone among the biological fields which are so situated at present, and the fact that it is in this position should offer a challenge to any genius who is looking for new fields to conquer.

Tolman (34) has very recently offered what sounds to me like an apologia for rat psychology tainted slightly by the suggestion of an inferiority complex for not studying human beings in a social milieu. This to me is unnecessary. If the work described above cannot be

justified, it is difficult to see how any general experimental psychology can be justified. Meanwhile, the animal psychologist should guard against a too ready carry over from his experimental situations to human living conditions. When I was a graduate student, a popular book in our subject was Herrick's *Brains of Rats and Men*. We sometimes amusingly quoted its last sentence: "Men are bigger and better than rats," and agreed then, as we can today, that at least 50 per cent of that statement is correct.

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RECEPTORS AND EFFECTORS: THEIR FUNCTIONAL CHARACTERISTICS.—*The Response Mechanism.* Living organisms explore the environment and make adaptive responses to it. This general biological process is brought about by a chain of dynamic events in an intricate system. The general character of this chain of activities has

been scrutinized, and the essential nature of the involved functional mechanism revealed.

The environment is explored through the receptors or sense organs. Adaptive responses are eventuated through the effectors or muscles and glands. The receptors and the effectors, although often widely separated spatially, are functionally unified through activities in the nervous system. Whether the coordination be highly complicated or less involved, the nervous system provides a means for the remote control of responses suited to the more or less complex momentary situation. The way this is accomplished is best conceived through a descriptive account of the underlying functional mechanisms.

Receptors are the first structures to be involved in the eventuation of a response to the environment. They differ in kind so as to react to a diversity of stimuli, being specialized with respect to different kinds of physical energy. The photoreceptors respond to radiant energy, the phonoreceptors to vibratory stimulation, the chemoreceptors to chemical action, etc. The organism is equipped to effect adaptive responses to diverse environmental conditions through its differentiated receptive organs.

Receptors are often classified on the basis of the general kinds of function which they serve. Those activated by physical energy emanating from a somewhat remote source are called exteroceptors. The more highly specialized of these are strategically located in pairs, and equipped with muscles that aid in the reception of the energy arriving from objects at different distances. Simpler in construction and scattered widely in the tissues of the body, either singly or in clusters, are the receptors that are known as interoceptors. These receptors respond to mechanical, thermal, and chemical changes in local regions within the organism. Receptors that are activated during walking, running, etc., when tension is impressed upon them in situ in the muscles, tendons, and joints are designated proprioceptors. Although different kinds of receptors are subsumed under each of these categories, and many differences regarding their modes of action are known, the general function of the receptors is directed to the eventuation of a response.

A receptor is a collection of epithelial cells specialized so as to register a characteristic receptor action in the presence of a given kind

of energy. In the more highly specialized receptors, the receiving unit is a mass of intimately associated epithelial cells and is designed to respond to energy of a relatively restricted character. The total receiving unit is connected with its primary center in the central nervous system through a system of many afferent nerves. Through the activities occasioned in the receptor is initiated a sequence of dynamic events through which the nature of the environment is indicated.

Being differently activated, the receptors of the organism comprise signalling systems for diverse kinds of environmental change. The current view regarding mode of activation in principal receptors is essentially as follows. The receptive unit in the *taste* bud is set into activity through chemical interaction between substances conveyed in solution through the taste-pore and other substances stored in the epithelial cells. The *olfactory* receptor is excited through chemical action when volatile particles, borne through the air into the nasal passages, become dissolved in the mucous fluid that over-spreads the small area in which the branches of the first cranial nerve terminate. In the presence of vibratory stimulation, the *inner and outer hair cells* distributed along the spiral lamina of the cochlea respond selectively to the characteristics of the disturbance occasioned in the endolymph by the alternating action of the system of membranes and ossicles in the middle ear. Substances that are derivatives of carotene are stored in the outer terminals of the *retina*, and the energy afforded when radiant energy is absorbed acts so as to occasion photochemical and chemical activities. The tension that is impressed during muscular action upon receptors located in the *muscles and tendons* sets up activity in the proprioceptors. Through its differentiated receptive structures, the organism is enabled to cope with a diversity of environmental changes and to respond to a variety of conditions.

Activity in the receptor is antecedent to and initiates activities in the supplying afferent nerves. The way in which activities in the receptors excite those in the nerves has not been fully elucidated, although the photochemistry of the retina and the cochlear microphonic are presumed to constitute manifestations of receptor activities through which activities in afferent nerves are initiated and sustained. Evidence

obtained through electrical recording techniques reveals that definite quantitative relations exist between the intensity or area of a stimulus and the activity in the nerve, so it may be assumed that the receptor converts some aspect of the external energy of the stimulus into a pattern of neural energy. The pattern of neural energy is propagated over nervous pathways to the primary center in the central nervous system.

Afferent fibers differ somewhat in size, and this difference is believed to determine differences in the rate of nervous conduction. The sensory nerves which supply the receptors in the skin include three types. The large myelinated fibers have a conduction rate of 100 to 5 meters per sec.; the smaller, less heavily medullated fibers conduct at velocities between 14 and 3 m. per sec.; the very small, unmyelinated fibers conduct at rates varying between 2 and 0.6 meters per sec. Fibers in other sensory systems are also differentiated to some extent in respect of fiber diameter. The efferent fibers also exhibit differences in diameter measurement, depending largely on the kind of muscle which they supply.

The situation which constitutes a stimulus to a given receptor usually is not very homogeneous. The incident energy emanating from a local part of the environment is differentiated from that coming from the immediately surrounding parts. This differentiated field of incident energy establishes differing activity characteristics not only in different parts of the receptor field, but also in the afferent system of nerves which is connected with the primary nerve center. During a sustained presentation of a variegated stimulus, physiological gradients are induced in the primary nerve center through the differentiated input of activities in the total system of afferent nerves.

Nerve activity involves certain organic changes. The nature of some of the changes has been brought to light through studies in which the functional properties of nerve during activity and during quiescence have been compared. Although further biochemical analysis will be needed before the involved functional mechanism is thoroughly understood, the information that already is available provides definite insight into the nature of events which provide for intercommunication between the receptors and the effectors. During stimulation in a receptor field, the activated nerves con-

sume oxygen more rapidly, yield carbon dioxide in greater quantity, and produce more heat. It has also been shown that in autonomic nerves at least, acetylcholine is produced both at the synapse and on the neuronal surfaces. Other indications that chemical by-products accumulate in the nerve during the time that the nerve is involved in activity are found in the observation that, during sustained stimulation at constant intensity, the length of the refractory period of the nerve increases many-fold. This decline in the capacity of the nerve to conduct during continued activity may be presumed to be due to an accumulation of chemical by-products which affects the rate of recovery in the nerve immediately after each discharge.

Further details regarding the organic changes which are involved in nerve conduction are needed before a complete specification of the dynamics of nerve conduction can be rendered. In spite of persevering and discerning study, the depths of this problem have not yet been fathomed. However, certain theoretical conceptions have been projected that may serve as guides to future workers. One of the most suggestive of these is the membrane hypothesis. According to this conception, the membrane of the nerve in the resting state is impermeable, with negative and positive charges organized in an orderly way, the negative ions on the inside and the positive ions on the outside of the membrane. During stimulation, however, the local activity in the receptor gives rise to a wave of activity which depolarizes the membrane as the wave of activity proceeds along the nerve. At a given instant of time the membrane is locally rendered semi-permeable and the two kinds of charges become intermixed. The recovery period, which sets in just after the wave of activity has passed, involves *inter alia* the restoration of the original orderly distribution of ions along the membrane. This conception of the mechanism of conduction is a tentative statement and may presently be found to represent a part of a more complete description of the complex chemical changes that are involved in nerve activity.

Through an involved sustaining mechanism embracing interchange among the respiratory, alimentary, circulatory, and neuromuscular systems, the receptors are automatically maintained in a state of readiness to respond, the nerves in readiness to conduct, and the effectors pre-

pared to react. In this way the materials utilized in receptor activity, in conduction, and in muscular action are supplied as needed. The time required to replace these materials is known as the recovery period. Understanding regarding the diverse modes of interchange which take place among nervous, muscular, respiratory, alimentary, and circulatory systems is essential to a thorough-going treatment of the means of intercommunication which normally is maintained between receptors and effectors.

THE PHOTORECEPTORS

The photoreceptors are assumed to be the rods and cones, the outer terminals of the nervous network which is the retina. These structures contain derivatives of carotene, photopigments sensitive to light. Several of these substances are present in the cones, and the special one found in the rods is called rhodopsin.

During irradiation, the photopigments absorb some of the radiant energy, giving rise to a dual response: an initial photochemical reaction coupled with a secondary reaction. The latter is catalysed by the substance formed in the initial reaction but has the thermal characteristics of an ordinary chemical reaction. Analysis reveals this complex reaction to comprise a cycle, *viz.*, rhodopsin is first broken down into retinine and protein, one portion of the retinine being resynthesized into rhodopsin while the other portion is undergoing conversion to Vitamin A and protein. The Vitamin A is relatively instable and also is ultimately resynthesized into rhodopsin. The functional economy of the cones is sustained through a corresponding cycle in which *e.g.*, iodopsin is converted into a different retinine, which in turn is converted into a different Vitamin A and protein, with a portion of the retinine and practically all of the Vitamin A being resynthesized into the original photosensitive substance. Since several photopigments are present in the cones, it is conceivable that as many distinct cycles occur as there are distinct photopigments. Owing to their greater complexity and to their greater imperceptibility, the reactions in the cones today are less well understood than are those which occur in the rods.

The activities which are eventuated in the rods and cones when radiant energy is absorbed by their photopigments constitute the necessary condition for the propagation of neural impulses

throughout the visual mechanism. The mode of neural transmission in the visual mechanism depends upon the nature of the nervous connections which are laid down among the neural elements. In the retina these connections provide for a dual visual mechanism. One of these is illustrated by the kind of connection that is provided in the fovea and which is basic to clear vision, the other by the kind of connection that obtains, in general, in the parafovea and which underlies diffuse vision in faint light. In the fovea each cone is individually connected with a midjet bipolar and a ganglionic cell (private line plan) and the elements lack interconnecting branches. However, in the parafovea, groups of rods or cones (or both) collect into each mop and brush bipolar and their inner processes and branches provide connections with a number of ganglionic cells (Polyak).

The way in which activities are functionally interrelated in different parts of the visual mechanism has been zealously investigated recently by a host of scientific workers, chiefly through the technique of electrical recording. The continuity of activities is not easily detected, however, through a comparative study of the action potentials that have been obtained from the retina, the optic nerve, and the visual cortex. The clarification of this intricate neurophysiology depends upon the development of techniques by which the continuity of neural events can be more definitely revealed. Many studies have served to show that summation and inhibition occur in the cortex under given conditions of stimulation. Others have shown that a lawful relationship exists between quantitative variables of the stimulus (intensity, extensity) and the character of an index response, *e.g.*, latent period. The latter suggest that, to some extent at least, the nerves in the complex visual system subscribe to the general laws which govern activities elsewhere in individual nerves. Further details regarding the neurophysiology of the visual mechanism are sorely needed to clarify many of the visual functions which have been investigated with much painstaking care.

Although the reception of radiant energy in this intricate neural mechanism depends primarily upon energy absorption in the photoreceptors, several special ocular mechanisms are utilized as aids to the reception of light. The light reflex, for example, serves to control the amount

of energy that is admitted through the pupil. When the luminous flux penetrating the pupil is increased, the pupil constricts; when the light density is decreased, the pupil dilates. When highly illuminated, the pupil narrows down to a diameter of about 2 mm., while in very faint light the diameter of the pupil may increase to about 8 mm. The variable aperture through which light is admitted into the eye is reflexly governed by two sets of muscles in the iris, one with the muscular elements running around the pupil which acts as a sphincter, and the other with the muscular elements arranged radially in the iris so that their action brings about an increase in the size of the pupil.

One of the chief functions served by the activities that are eventuated in the visual mechanism is the formation of images, and clear images of objects within a finite range of distances depend in a very essential way upon the accommodation of the lens. For objects at a distance of more than about 100 feet or so, no accommodation is required, but as the distance between the object and the eye becomes smaller, the lens needs to undergo a change so as to bring the portion of the total bundle of rays which emanates from the particular object into sharp focus. The lens is suspended from the edge of the ring of ciliary muscle by ligaments, and accommodation is reflexly controlled through changes in the muscle. As the muscle is brought into contraction in an increasing degree, depending on the proximity of the object up to the limit of the near-point, tension on the suspensory ligament is lessened more and more so as to allow the lens to increase its curvature chiefly at the anterior surface. This increases the power of the lens sufficiently to bring into sharp focus the rays which emanate from the proximate object.

Normally the visual image of an external object is a binocular compound, *i.e.*, the combination of the two images furnished by the two eyes. The fusion is effected in the central nervous system through a combination of the input of afferent impulses over the right and left optic nerves. The limit of fusion may be experimentally determined by maintaining fixation upon a stationary mark at a given distance while a similar mark is slowly moved away from the position of coincidence.

Another important visual function is that of perceiving objects in space, and the effectiveness

with which an organism makes adaptation to spatially disposed objects depends in a very large measure upon the efficiency of this function. It depends essentially upon image formation, and involves the mechanism for clear vision.

The relative distance of objects can be perceived monocularly in terms of interposition and differences in haze and size. It is in terms of variations in these criteria that the artist is able to produce the illusion of distance in a painting. Parallax also may serve as a monocular cue, *i.e.*, when the head is moved laterally, objects in the distance move in the same, those near at hand in the opposite direction. The degree of relative movement varies directly with the distance separating the objects and the lateral displacement of the head.

Binocular vision furnishes additional cues to depth perception. One of these is convergence, the two eyes converging increasingly as the proximity of an object increases. Another important factor is retinal disparity, which depends on the fact that each eye contributes a different view of space, owing to the distance separating them. The striking illusion of depth that is observed through the stereoscope is based upon this factor. The degree of disparity varies inversely with the square of the object-distance. Consequently, an important cue to depth inheres in the fused binocular image of the object in space.

The sensitivity of the photoreceptors to differences in the brightness of two apposed matt surfaces is measured by varying the energy which supplies one field until it becomes just perceptibly brighter (or darker) than the constant field. This determination has been made for surfaces emitting various homogeneous wave-lengths and for mixed light over a wide range of intensities (12 log units). As a function of log intensity, the reciprocal of the threshold is found in all cases to be a declining function, the rate of decline being rapid at first and becoming progressively less and less as the intensity of the stimulus is increased. The theory of neural availability is designed to indicate the nature of the mechanism involved in such intensity functions (Holway). This conception assumes that sensitivity depends on the number of neural elements available at the time that a discrimination is made. Sensitivity is assumed to be maximal when all elements in a given system are available and becomes pro-

gressively less and less as more and more elements in the functional mechanism are unavailable when the discrimination is being made. When stimulus-intensity is low, provided there has been no significant pre-exposure, sensitivity is high, *i.e.*, the threshold small, because practically all of the neural elements are available; however, when the intensity is high, or if a high pre-exposure has been used, sensitivity is lower and the threshold larger because the number of the available neural elements is greatly reduced. This view regarding the neurophysiology of intensity discrimination is consistent with intensity functions for various other receptors as well as for the photoreceptors.

Differences in brightness influence the reactions of the photoreceptors to flicker. If a circular field containing 180° black and 180° white is slowly rotated, it is perceived to flicker. As the rate of rotation is increased, the frequency at which flicker first becomes imperceptible is reached. The critical fusion frequency varies with the level of the illumination under which observations are made. At low illuminations, fusion may occur at a frequency as low as 10 or 15 r.p.m., but as the illumination is increased, fusion occurs at a higher r.p.m. and may reach 60 or 70 r.p.m. The curve showing the manner in which c.f.f. varies as a function of intensity exhibits a break, and is assumed to be based upon two integral curves, one representing the function of the rods, the other that of the cones.

When the circular field contains unequal amounts of white and black, the frequency at which fusion occurs is lower when black is the dominant component, and higher when white contributes more than 180°. These findings signify that the excitatory processes underlying flicker persist longer under conditions of low than under those of high illumination, *i.e.*, the underlying excitatory conditions persist longer when neural availability is great than when a smaller number of elements is available.

The sensitivity of the photoreceptors is found to increase throughout a protracted stay in the dark, increasing most rapidly at first, and then at a rate which is more and more attenuated as time progresses. When stimulations are restricted to the fovea, the total range of increase in sensitivity is less, and the curve indicating change in sensitivity is regular, however, when stimulations are made in the parafovea, the

total range of increase in sensitivity is much greater and the function obtained exhibits a break. The break is assumed to indicate the transition from cone to rod activity, and the greater range regarding increase in sensitivity depends upon the difference in the functional mechanism in the fovea where cones and nervous elements are individually connected and in the parafovea where the activities in a number of rods and/or cones collect into an individual nerve fiber. The latter mechanism allows a much smaller luminous source to produce the minimum number of impulses per unit time required for a cortical response.

The photoreceptors differentiate differences in color and in modes of appearance of color. Extensive investigations have been made in regard to the extent of color differentiation, and elaborate techniques have been developed in connection with the study of this problem. The monochromometer provides a suitable means for controlling wave-length, the physical correlate of hue. Visibility functions are obtained under such well-controlled conditions and depict relative sensitivity as a function of wave length. Maximal sensitivity (the reciprocal of the smallest threshold) is found to occur at about 554 μ when the illumination is high, but shifts toward a shorter wave length as the illumination is reduced, being maximal at 511 μ under twilight conditions. The change in wave length at which maximal sensitivity occurs as a function of change in illumination is known as the Purkinje phenomenon.

The photoreceptors in the fovea are more sensitive to color than are those in the parafovea. The perimeter is utilized in testing differences in color discrimination in the photoreceptors in different parts of the retina. In a zone just outside of the fovea, the characteristics of color discrimination for a normal eye are comparable to those in subjects who are deficient in respect of color discrimination (protanopes, deutanopes), while in the outermost parts of the retina, color discrimination is lost altogether. The zones determined in perimetry are not to be regarded as fixed but as functional, since they are found to vary with the size of the stimulus used, or with the intensity of the illumination.

Many suggestions have been made regarding the neural mechanism basic to color differentiation. In spite of zealous efforts on the part

of some of the ablest men in visual science, however, no theory has been definitely verified. The view of Young-Helmholtz has exerted the widest influence. This is based on the conception that there are three kinds of cones, or three kinds of activities, selective with respect to wave length. Later views are based upon similar assumptions, and some workers have proposed views involving a more detailed differentiation of activities in the retina and in the optic nerve. This is illustrated in the view of G. E. Müller. Müller states that color depends upon a psychophysical excitation, and that several processes intervene between the incidence of light upon the retina and the eventuation of the psychophysical excitation. Radiant energy acts first upon photosensitive substances in the retina, giving rise to sensitizing processes. Three sensitizing processes, selective with respect to wave length, are assumed to exist and depending upon differences in the composition of the incident light, they are brought into action in differing relative intensities. Each sensitizing process comprises a catalytic coupling, in which a primary substance is converted into an intermediate-product that, in turn, acts by catalysis to occasion the accumulation of an end-product. As soon as the latter phase of the photosensitive process reaches a critical amount, secondary excitations which are basic to chromatic effects begin to be initiated in the retina and in the optic nerve as well. The secondary chromatic excitations are different for each of the three (initial) photosensitive processes, and through the simultaneous action of the three initial photosensitive processes in different relative intensities the secondary (chromatic) excitations are eventuated in sufficient diversity to provide resultant excitations for the psychophysical excitations basic to all hues. The details of this specification are as follows. The first photosensitive process gives rise in the retina to conversions that are basic to red and yellow, the second one to conversions to yellow and green, and the third one to conversions involved in the eventuation of blue. Each of the secondary conversions in the retina is involved in producing three additional conversions in chemical substances located farther along in the optic tract: red giving rise to red, yellow and white; yellow to yellow, green and white; green to green, blue and black; and blue to blue, red and black. Thus, depending upon

variation in wave length composition, the two reversible conversions in the retina $R \geq G$, $Y \geq B$ and the three conversions in the optic tract $r \geq g$, $y \geq b$, $w \geq bk$ are brought into action in diverse combinations, directions and proportions so as to provide resulting chromatic excitations sufficiently diversified to furnish the psychophysical excitations for all nuances of color. When the eye is stimulated by mixed light in which no wave length is dominant, Müller assumes that the selective processes are aroused in the definite relative amounts in which, in consequence of inherent antagonistic relations, the chromatic effects are mutually set aside and only the $w-bk$ conversion responsible for achromatic sensation is effective. Müller devoted much of the later years of his long life to an exhaustive effort that was designed to show that his assumptions regarding the mechanism for color are consistent with an enormous literature. Further intensive work will be needed, however, if this conception is to be validated.

The acuity of the photoreceptors is measured in experiments in which the limit for distinguishing detail is determined. As a function of illumination, acuity as regards the discrimination of two small luminous points is found to increase slowly over a small range, then to increase more rapidly over an extensive range of intensities, and finally to progress very slowly over a final range.

Acuity to differences in depth is measured by various standard procedures. A fine mark, e.g., a line or dot, is adjusted with respect to the position of a similar stationary mark just above or beside it (vernier acuity); or so as to coincide as exactly as possible with the position of the stationary mark (coincident acuity). These determinations can be made either monocularly or binocularly. Stereoscopic acuity always depends on binocular observation, in which the smallest perceptible difference in the depth of two marks is determined. The measured difference is converted to angular units by using the distance separating the axes of the two eyes as base. An extensive literature concerning depth acuity indicates that under favorable conditions one or less than one second of arc can be distinguished. When visual acuity is determined as a function of range, it is found to increase with an increase in range.

Visual acuity is optimal for stimulations in

the fovea, and decreases rapidly as stimulations are made at parafoveal distances in any direction away from the fovea. It was long believed that the limit for acuity was determined by the diameter of the individual retinal element, however, evidence has tended to show that acuity under favorable conditions is too good to be explained on this basis. Evidence from comparative anatomy indicates that animals in which the internal nuclear layer of the retina has greater dimensions (width and thickness) have greater acuity (Detwiler), however, a detailed mechanism for acuity eventually is to be specified in terms of functional rather than structural characteristics of the visual mechanism.

PHONORECEPTORS

The ear-drum responds to air disturbances occasioned by vibrating bodies and transmits the alternating pressure-differences impressed upon the drum to the oval window. The receiving units for sound are collections of about 15,000 hair cells, which are distributed along the spiral membrane of the cochlea of the inner ear. About one-fifth of the hair cells—the inner hair cells—are arranged in a single row along the inner side of the arch of Corti. The larger number of outer hair cells is arranged in banks, three deep at the base, four deep in the middle, and five deep at the apical end of the cochlea. These sensory cells are connected through definite nervous tracts with the auditory center in the temporal cortex. The fibers of the cochlear branch of the eighth cranial nerve supply them and make connection with other tracts which converge upon the lateral lemniscus to reach the primary auditory center. Although the structural features of the phonoreceptors have been carefully described, the way in which they are activated is not clearly established in all details.

One view is the following. The cross fibers of the basilar membrane, upon which the spiral organ of Corti rests, respond sympathetically to the character of the disturbance being set up in the endolymph while the alternating pressure arriving from the sound source is being delivered through the system of membranes and ossicles of the middle ear. The longer cross fibers respond to the lower and the shorter fibers to the higher frequencies. Although data recently obtained through the technique of stimulation deafness seem to be fairly consistent

with this view, certain difficulties confront those who advocate the view that the hair cells are activated in this manner.

A different view is that the hair cells are activated through the impacts which are impressed upon their cilia by the overhanging tectorial membrane. This is a gelatinous structure which extends over the hair cells and is capable of responding differentially to changes in frequency and intensity of stimulation.

If resonance is the principle through which a local portion of the basilar membrane (or of the tectorial membrane) is activated when a pattern of disturbance of definite frequency is set up in the endolymph, this principle meets a limit at frequencies above 800–1,000 c.p.s. This is owing to the fact that the functional properties of the nerve do not allow it to follow every frequency above this limit. To circumvent this difficulty, it has been suggested that above this frequency, response to change in frequency depends upon the total volley of impulses arriving in the temporal cortex. Details regarding the nature of events in the cortex are still largely lacking. When more details are forthcoming, the mechanism for frequency differentiation may be found to be fundamentally central rather than peripheral for all frequencies.

The phonoreceptors are capable of responding to periodic vibrations embracing frequencies over a range of 16–16,000 c.p.s., although this range contracts somewhat, particularly at the upper extreme, as a function of increasing age. Threshold measurements made over the total range of audible frequencies reveal that sensitivity (the reciprocal of the threshold) is maximal in the range of 1,000–2,000 c.p.s., and decreases progressively and rapidly as the frequency of the test-stimulus departs more and more in either direction from the range of greatest sensitivity.

Differential sensitivity to a given frequency has been measured over a range of intensive units in terms of the increment in pressure at the ear that is required to occasion a just perceptible increase in loudness. When such measurements are made for a given frequency, *e.g.*, 800 c.p.s., over a wide range of intensities, a function is obtained which shows how differential sensitivity varies as the intensity of a given frequency is increased. The typical curve of this function reveals that sensitivity is great-

est initially, decreases as intensity is increased rapidly at first, and then at a continuously more and more attenuated rate of change. Curves obtained for other frequencies are similar in form, although the total range of intensities is somewhat reduced.

Immediately following exposure to a strong vibratory stimulation for a given period, sensitivity to the given frequency is reduced. The auditory mechanism has adapted to the stimulus. When sensitivity is measured at successive intervals of time immediately after cessation of a strong protracted stimulation, a curve indicating the recovery of sensitivity is obtained. The curve exhibits a typical course, in which recovery is more rapid at first, then more and more gradual until recovery is complete. After a stronger (or longer) pre-stimulation, the curve indicating return of sensitivity exhibits the same general form; however, insensitivity initially is still greater, and the initial rate of recovery and the total time required for recovery are greater.

The theory of neural availability was conceived to supplement the volley theory so as to account for these findings. The fact that sensitivity is greatest within the limits of 1,000–2,000 c.p.s. denotes that neural availability is greatest for this range of frequencies and becomes progressively less for frequencies as one ascends or descends in the frequency scale on either side. For any given frequency, sensitivity is greatest at low, and least at very high intensities because the number of available elements is greatest in the former and less and less as one proceeds upward in the scale of intensities. After a pre-stimulation, the number of available elements is reduced temporarily (Field and Brücke). Hence sensitivity is reduced. During recovery from pre-stimulation, normal sensitivity gradually returns because the number of available elements comes back to normal.

VESTIBULAR RECEPTORS

In the inner walls of the membranous labyrinth of the inner ear are collections of hair cells which are activated by gravitational, propulsive, and centrifugal forces induced in the endolymph during and immediately following many bodily movements. These are the maculae in the utricle and saccule, and the cristae of the semicircular canals. Afferent impulses from these receptive systems often influence the effer-

ent impulses so as to mediate important postural adjustments.

The fact that impulses from these receptors interact with centers governing specific kinds of behavior is indicated in various ways. Conspicuous among these are the nystagmic (ocular) movements which are photographed during and immediately following a period of rotation. A variety of these are distinguished—e.g., jerky saccadic movements, lagging pursuit movements, and sudden compensatory movements. The input over the vestibular branch of the eighth nerve also interacts with the centers which involve the efferent output to the arm, giving rise to what is technically known as past-pointing.

The effects of excessive and sustained stimulation of this receptive mechanism, often encountered in modern modes of rapid transit, are well known, e.g., seasickness, flying sickness. The fact that interaction occurs in varying degrees has been revealed in experiments which show that the after-effects of rapid rotation are greatly lessened if the eyes are kept closed.

VISCERAL RECEPTORS

Inlaid in the membranous linings and in the tissues of the alimentary, reproductive, circulatory and respiratory systems are various receptor cells which are responsive to chemical, mechanical and/or thermal stimuli. These visceral receptors include free nerve-endings and encapsulated terminals which occur singly or in small collections, although they are differentiated functionally to respond to different kinds of stimuli, so as to meet a variety of needs.

In the upper alimentary tract are collections of receptors which serve to indicate the suitability of the materials that are to be taken into the tract to serve the general nutritive functions. These are the gustatory and olfactory receptors. They are sometimes designated chemoreceptors, because the stimuli enter into chemical action with substances residing in the terminals of the receptor in initiating the characteristic receptor action.

Taste cells are elongated structures that are assembled in the form of a bud. Taste buds appear in chains or singly, being scattered somewhat over the tongue and chiefly in the crevices along the sides and back. They appear also in the membranous walls of other struc-

tures in the posterior pharynx. These receptive cells are supplied by fibers from branches of the fifth, seventh and ninth cranial nerves. The activities initiated in the taste buds are conveyed through these nerves to the central nervous system.

Among the investigations made to determine the nature of function in these receptors are those concerning reaction-time. This index-response is found to vary inversely with the pressure, the concentration, and the taste of any given gustatory solution, as well as with the size of the area exposed to the substance. These findings denote that gustatory reaction-time becomes shorter as more and more neural elements are involved in the reaction. Measurements of differential sensitivity to a given gustatory solution show that sensitivity is optimal at low intensities, and decreases progressively, at first more rapidly and then more and more slowly, as the intensity of the stimulus is increased. This result also is consistent with the conception of neural availability. Investigations have not yet revealed whether a taste bud contains several different kinds of cells or whether a given cell is stocked with several different kinds of substance which give rise to different kinds of activity in the receptive system to account for the primary gustatory qualities (sweet, salt, sour, bitter).

The olfactory receptor comprises a collection of nerve terminals in the upper nasal cavity. These cells are activated through chemical action when particles of volatile substances borne in the air are taken into the nostrils and become dissolved in the fluid which overspreads them. The activities which are the sequel to this chemical activity are propagated over the first cranial nerve to the olfactory center in the hippocampus.

Although the olfactory system gives rise to a large number of different qualities, evidence has not yet been brought forward to indicate whether different kinds of olfactory cells are basic to qualitative differences or whether the cell is stocked with a variety of chemical substances through which different modes of action are eventuated in the given cell.

However, evidence regarding the lawful relations existing between the stimulus and the receptor has been brought forward. The rate of adaptation to a given olfactory substance is a linear function of the amount of the stimulus

presented to the receptor. Sensitivity is greater for dirhnic than for monorhnic stimulation. Differential sensitivity is maximal at low intensities and becomes less and less, at first more rapidly and then more slowly, as the intensity of the stimulus is increased. These findings are consistent with expectation in terms of the conception of neural availability.

The receptors in the lower alimentary tract are largely protective in function, responding to variegated thermal and mechanical stimulations. Local parts of the lining of the reproductive system contain the encapsulated terminals of afferent nerves which respond to light and thermal pressure so as to build up the spastic reproductive reflexes. The terminals of afferent nerves in the respiratory and circulatory systems are responsive also to extreme modes of stimulation.

SOMESTHETIC RECEPTORS

The terminals of afferent nerves are distributed at different levels of the integument investing the tissues of the body. These receptors are activated when local (pressure, thermal, chemical) changes are occasioned. A large number of receptor-structures have been described, *e.g.*, free nerve endings, hair roots, organs of Krause, Golgi-Mazzoni, Ruffini, Merkel's discs, corpuscles of Meissner, Pacini, Herbst, but a specific receptive function for all of these various structures has not yet been established. The afferent processes attending diverse stimulations on the skin, however, are propagated over well differentiated pathways to the somesthetic center in the parietal lobe of the brain.

Persistent efforts have been made to determine the structures specifically involved in the eventuation of each of the basic cutaneous qualities—pressure, pain, warmth, and cold. To date, however, these efforts have not been successful. The method of electrical recording has revealed a definite difference in the nature of activities in afferent nerves when typical stimulations for pressure and for pain are made; *i.e.*, long and narrow spikes for pressure, and short and wide ones for pain. The prevailing view is that a different receptor is to be specified for each of these qualities.

Surveys of the extensive body of experimental literature have frequently been made, the most thoroughgoing recent one being that of von Skramlik. The studies of chief concern are those

dealing with the sensitivity and acuity of these receptors.

Two distinct methods have been utilized to study the acuity of the skin, the error localization and the limen of duality. For any given surface of the body, the former is usually found to be about one-third the size of the latter. This is owing to the fact that the error of localization is based on trials in which two successive stimulations are made so close as to be indistinguishable, whereas the two-point limen includes simultaneous stimulations by two points separated widely enough so as to be perceived as two in one-half of the cases and separated so as to be just not distinguishable as two in the other half of the cases. The fact that tactual acuity, as measured by either of these methods, is many times greater in certain regions (lips, finger tips) than in others (thigh, back) depends on differences in the density and perhaps the character of the receptors per unit area.

The sensitivity of the skin has been determined chiefly with respect to changes in pressure and temperature. When precautions are taken to reduce extramodal stimulation to a minimum, the sensitivity functions obtained in both of these cases show the same general trend; *i.e.*, differential sensitivity (= sensitivity to difference) is greatest at low intensities, decreases rapidly at first, then more and more slowly as the intensity of the pressure or temperature is increased. This is consistent with the manner in which neural elements may be presumed to enter with these determinations. When the intensity is low, more neural elements are available, and sensitivity is greater; as the intensity becomes greater, the number of elements available for the discrimination of an increase in intensity decreases, and the sensitivity becomes poorer.

THE PROPRIOCEPTORS

The proprioceptors comprise diverse structures scattered throughout many bodily tissues that respond to tensile stimulation. Chief among these are the muscle spindles, tendons of Golgi, and Pacini corpuscles. The muscle spindles are distributed here and there among other elongated muscular cells which are supplied by efferent nerves. Each muscle spindle is a separate unit, and comprises one or more cylindrical cells which are considerably smaller than the associated muscular cells which im-

press tension upon them during a contraction. Imbedded in the tendons and in the fascia adjacent to the tendons are structures known as tendons of Golgi which also are receptive to the tensile stimulation delivered when the muscles to which they are attached contract. Other encapsulated endings, chiefly Pacini corpuscles inlaid in the membranous linings of the joints, are activated by the deformation occasioned *e.g.*, when a ball moves in its socket. This system of receptors serves to indicate the nature of local changes in position in various parts of the body.

The input of afferent impulses from the proprioceptors is conducted to centers at various levels of the nervous system—first to the spinal cord, next over the proprioceptive paths in the posterior horn to nuclei in the medulla, then either over the inferior peduncle (restiform body) to the cerebellum or over the lateral lemniscus to the thalamus, and finally to the somesthetic cortex in the parietal lobe of the cerebrum.

Various functional mechanisms are provided for in the proprioceptive system, with the afferent input being integrated at different levels in the nervous system. The postural reflexes which are differently utilized in different forms of locomotion depend essentially on integration in subcortical centers. The motor skills which involve the use of tools, instruments, and machines, depend, particularly initially, upon integration at the cortical level. The general importance of the functions served by the proprioceptors has served to give great impetus to the study of functional characteristics of proprioceptive mechanisms. Various techniques have been conceived and developed.

The way in which impulses from proprioceptors vary, when tensile stimulation varies, has been determined via the technique of electrical recording. The frequency of impulse discharge from muscle spindles is found to increase in direct proportion to the intensity of mechanical or electrical stimulation. The discharge from Pacini corpuscles has been shown to exhibit a similar relation to changes in intensity of stimulation.

The sensitivity of the proprioceptors has been much studied through the technique of weight discrimination. For a particular proprioceptive system, sensitivity is greatest when intensity is low and decreases at first more rapidly and

continuously at a more attenuated rate as the intensity of stimulation is increased over a wide range of intensities. This is owing to the fact that the discrimination is based on a smaller number of neural elements as the intensity of the stimulus is increased. By the same token, sensitivity is found to be greater for bimanual than for unimanual comparisons, and is greater for a more extensive system of muscles than for a more restricted system, *i.e.*, when weights are lifted with the shoulder as fulcrum sensitivity is greater than when the elbow is fulcrum; sensitivity is least when the wrist is fulcrum.

The sensitivity of a given proprioceptive system is impaired immediately following pre-exposure to a weight. When the pre-exposure involves a heavy weight, the degree of reduction in sensitivity is greater than for pre-exposure to a lighter weight. Likewise a longer pre-exposure to a weight serves to reduce sensitivity to a greater extent than a shorter pre-exposure to the same weight. The reduction in sensitivity as a function of pre-exposure time is correlated with progressive changes in the functional mechanism which have been revealed by other techniques, *i.e.*, the progressive increase in the refractory period during a sustained stimulation and the accumulation of organic by-products of nerve activity, *e.g.*, increase in carbon dioxide, heat production, etc. These changes in the system signify that the number of neural elements available for a discrimination decreases progressively as a function of time during a moderately strong pre-exposure and at a rate which varies directly with the amount of the pre-exposure stimulation.

The way in which dynamic changes are induced in proprioceptive systems during a sustained stimulation provides an explanation of various inconsistencies which often have been reported in the comparison of weights. The heavier of two weights is judged to be the lighter in bimanual comparisons just after a protracted pre-stimulation has been made on the side which is to be used to lift the heavier weight. Owing to the temporary increase in the refractory period on the pre-stimulated side, fewer impulses are able to be propagated to the somesthetic cortex over the nerves from that side than over those from the other (unfatigued) side. The observation that a light

weight seems lighter than usual (so-called negative weight) just after a period in which heavy weights have been handled denotes that fewer impulses than usual are propagated to the cortex during the time that the after effects of the previous intensive stimulation are still operating in the proprioceptive system.

THE EFFECTORS

The Response Unit. A motor response to external stimulation involves an overt expression of activity in the effectors—the muscles and the glands. The activity in the muscles is the consummation of a train of neuromuscular events. The activity gradient that is occasioned in a primary sensory center during an external stimulation gives rise to locally differentiated trains of impulses which pass to the motor cortex, down over the motor tracts, and out over the efferent nerves to the muscles. The way in which trains of neural activities engage the muscles in the kind of activity that is a suitable response to a momentary situation is to be understood only through a detailed knowledge of the functional events involved in eventuating organic movement. •

The nature of the response eventuated depends in part upon the kind of muscle brought into action. Two kinds of muscle—striate and smooth—are usually distinguished, in addition to the special muscle found in the heart, the organ designed to serve the vital function of perfusing blood through the tissues of the body. In general, striate muscles include the muscles in which fibers are arranged in bundles, invested by fascia, and attached to the skeletal framework of the body. These bundles vary in size, depending upon the parts to which they are attached and the nature of the work which they are designed to perform. Striate muscles receive their nerve supply from the cerebrospinal system and subserve numerous voluntary acts, *e.g.*, running, walking, jumping, climbing, throwing. Two subdivisions of striate muscle—light and dark—are distinguished on the basis of their appearance. Dark striate muscles contain hemoglobin, *i.e.*, corpuscles that resemble the hemoglobin of the blood and are believed to subserve activities that often need to be long sustained. Light striate muscle is a more specialized variety of striate muscle and is more exclusively involved in sudden responses.

In smooth muscle the individual fibers are

not arranged in bundles so as to provide for strength and promptness of action. Instead, they are assembled into the relatively thin muscular layers that appear, *e.g.*, in the walls of blood vessels and of the alimentary tract so as to sustain more attenuated (tonic) modes of muscular action. The efferent nerves which supply these muscles emerge from the autonomic chain of ganglia. Important involuntary functions, *e.g.*, peristalsis in the alimentary system, and vasoconstriction and vasodilation in the circulatory system, are subserved by activities eventuated in smooth muscles through activities in the autonomic system.

A conception of the way in which muscular response is eventuated is best envisaged through a detailed study of the characteristics of individual muscular elements. In striate muscle, these are cylindrical cells with tapered ends, varying from 1 to 40 mm. in length, and from 10 to 100 microns in diameter. Many of the elongated cells are compound, each being invested in a thin membranous wall (sarcolemma). Threadlike fibers (sarcofibrils) run lengthwise in the cell and are surrounded by a fluid (sarcoplasm). The fibrils exhibit alternate light and dark bands, indicating a complex composition. The individual fibers in smooth muscle are similar in form to those in striate muscle, but the dimensions are somewhat reduced.

Each muscle cell has its own circulatory and lymph systems, through which supplies are received and wastes eliminated. These cells are stocked with various organic substances: *e.g.*, myosin and myogen (proteins), glycogen (carbohydrate), phosphocreatine (nitrogenous material). The way in which activities in individual cells bring about a contraction is not fully to be elucidated, however, certain temporal relations regarding the changes which occur among the materials residing in the muscle cell during activity have been specified.

The fibril of an efferent nerve pierces the sarcolemma which invests the muscle cell, and ends either in a motor end-plate, which has dimensions of 40 to 60 microns, or in a grape-like terminal. The neurilemma of the nerve is continuous with the sarcolemma of the muscle cell, however, the myelin sheath is lost just before the cell is reached. Through this connection the nervous activities known to be attended by definite chemical changes (*vide*

supra) may be presumed in some as yet undisclosed way to be antecedent to and continuous with chemical relations within the cell.

In the resting state, a chemical balance is automatically maintained in the muscle cell by the alimentary and circulatory systems. This balance is altered, however, during nervous and muscular activity. Specific changes have been shown to take place. Phosphocreatine is broken down into phosphoric acid and creatine. This is a reversible process, *i.e.*, the phosphocreatine is subsequently resynthesized from its decomposition products partly during an anaerobic and completed during an aerobic phase of the period of relaxation. Somewhat later the glycogen which is stored in the cells begins to be converted into lactic acid, and the energy produced during this conversion is believed to be essential to bringing the sarcofibrils into the action which effects a shortening of the muscle cell. This conversion also is reversible, a large portion of the lactic acid being resynthesized into glycogen during relaxation. Oxygen, supplied through the respiratory and circulatory systems, is also utilized in this conversion. The chemical economy of the muscle cell needs to be elucidated in greater detail if a complete specification of the intricate dynamic relations which occur in muscle cells during activity is to be provided.

Interspersed among the cylindrical muscle cells which are supplied by efferent fibers are the muscle spindles supplied by afferent fibers. These comprise small bundles of 3 to 10 smaller muscle fibers (1 to 5 mm. in length) surrounded by several layers of connective tissue. When activities passing over the efferent paths bring about a muscular contraction, these smaller muscle cells (proprioceptors) are compressed, giving rise to an input of impulses over their afferent nerves. Through differences in the intensity and spatial distribution of these impulses, the nature of the ensuing output of impulses over the efferents is influenced so as to suit the varying needs of a momentary situation. In this way the nature of the neural output to the muscles is governed by the input over the afferent nerves from the muscles, and a sequence of muscular changes suited to the needs of a complex situation is eventuated.

Behavior patterns are manifestations of activities on the part of a population of muscle cells involving them in diverse temporal, spatial and

intensive relations. In simpler acts, the activities are restricted to a small system of muscles, while in complex acts the activities include muscle cells in widely scattered parts of the body. Skills that involve the use of instruments, tools, etc., depend upon learning to bring a population of effectors into action in suitable spatial, temporal and intensive relations. Through the characteristics of the action of individual cells and the way they can be brought into action in diverse relations, the diverse behavior patterns of the individual are provided for.

The central nervous system serves to coordinate activities in muscles in widely scattered parts of the body, *e.g.*, in such a complex act as maintaining balance in skating. The nature of the input over various afferent systems is brought to bear differentially upon diverse motor ganglia so that the muscles concerned with moving different parts of the body are brought into synchronized action. Momentary changes in the character of the afferent input are thus able to influence the character (intensive, spatial, temporal) of the pattern of impulses being distributed over the efferents.

The efferent nerves which emerge from the autonomic chain also supply a large number of glands. Some of these are concerned essentially with nutritive functions and thus are involved only indirectly in muscular action. They at least participate in the maintenance of various kinds of chemical balance among the materials which are stored up in the muscle cell. Other glands, *e.g.*, the adrenals, are known to play an essential supporting role in the activities of smooth muscle, *e.g.*, in vasoconstriction. The diverse ways in which glandular secretions influence various behavior characteristics are just being brought into focus, and painstaking efforts will have to be expended before their role is properly evaluated.

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RELIGION, THE PSYCHOLOGY OF.

—A number of texts have been published under the title of *Psychology of Religion*; but most of these books treat only a limited range of topics, confining themselves usually to the topics which today are classed under the heading of "Religious Pathology." Other books indicate more definitely the topics with which they deal, by titles such as: "Psychology of Religious Mysti-

cism"; "Psychology of Religious Belief," etc.; and journal articles have usually indicated the limited topics discussed by their authors.

The first book to be published under the title of *Psychology of Religion* appears to have been the one by Starbuck, (1) although other books which would have merited the name more logically had appeared under other titles. The second book which might have been called by this title, was James' *Varieties of Religious Experience* (2), although this book also dealt mainly with pathological topics, James' book still continues to be important, while Starbuck's has disappeared from most bibliographies.

So far no text has appeared which could serve as a text-book for a course in which religion is to be treated from the psychological point of view. What students want is information about religion which will enable them to evaluate the role which religion can play in civilized life; the usefulness for society and for the person. Such evaluation is possible for an author or an instructor who is well grounded in the principles and methods of group psychology, and of personal psychology (so-called "general psychology"), and who also is well oriented in the field of religion, and understands the comparative and genetic methods as applied in that field and in the field of group psychology.

Two difficulties are encountered in the attempt to instruct college students in the psychology of religion. The first is the lack of background, not only in group psychology, but also in general psychology, which I prefer to call "personal psychology." Apparently, since the era of "mental testing," courses in elementary psychology have failed to give students a grounding in scientific psychology, and ignorance of the principles and methods of group psychology is as evident.

The second difficulty arises from the complete ignorance of the broader aspects of the subject on the part of students of religion. Most students approach the study in the light of a particular religion such as Judaism, or of a particular Christian sect such as Methodism. Those who are anti-religious are as ignorant as are the pious; they are opposed merely to religious tenets and practices with which their limited personal experiences have familiarized them. These college students represent, of course, a cross-section of the general public, among whom ignorance of religion is as great. A useful text would be one which

should convey to the student, and to the general reader, basic information about the religions of the world, or at least about the so-called "great religions." Lacking such a text, the instructor in a college course has to consume time in giving the necessary information.

Any study of religion is really in the field of psychology, whether or not the one making the study is a psychologist. Religion is a feature of conscious life, and psychology is the science of conscious processes and their conditions. Religion, in its long course of development, has been produced by man's desires and purposes and the objectives he has consciously maintained. Hence the examination of these conscious processes is an essential task for the "Psychology of Religion." These determining factors, of course, must be examined with reference to the conditions under which they occurred and operated, just as personal psychology must be studied in relation to the organism and its environment.

The important conditions under which human desires and purposes have produced and further modified religion cover a wide range, including all factors which may be called "cultural." Geographical and linguistic conditions have been influential: war has had its impact, but the most important factors have been those which can be called economic in the broad meaning of the term "economic." Among the important economic conditions, the praxes of agriculture, horticulture and animal husbandry are admitted by all scholars to have been of major influence, regardless of the theoretical conclusions the scholars have drawn. Commercial and industrial conditions, and the praxes of hunting and fishing in the earlier periods, also need consideration.

That inventions made in the service of economic improvement have had influences on religion is evident from the adoption of the hammer, the axe, the spear, the sword, the ladder, and the wheel as religious symbols. The reasons why other inventions such as the plough and the mill for grinding grain did not become religious symbols must be sought; the reasons are easily conjectured, but no one seems to have investigated the problem.

It may be admitted that pathological topics such as conversion, repentance, etc., are involved in the full study of the psychology of religion, but the normal features of religion

are far more important. Psychologists are more interested in preventing the pathological conscious processes than they are in them as indications of the nature of religion; they are studied mainly in the interest of religious prophylaxis.

In almost all subjects of instruction today, it is admitted that the facts of the present can be understood only through the results of application of the comparative and genetic methods. This is as true of the study of religion as it is of zoology or linguistics. To evaluate religion one must understand religion, and to understand religion one must know a great deal about its evolution. Unless one understands the roles which religion has played in the cultures of the past, one cannot understand the role it plays at present; still less can one evaluate the role it may play in the civilization of the future. Comparison of present-day religions is also helpful.

For collegiate instruction and for the general reader, the problem raised by these requirements is difficult indeed. There are a few scholarly histories of religion, among them two works by Moore (3, 4), and two by Hopkins (5, 6); but these books are not easy reading for the average person. As for more elementary texts on religion from the comparative point of view, few are satisfactory. Aside from biased points of view of the authors, they depend on assumptions which have been discarded by scholars, and some of the authors appear not to understand the materials they present, and so miss the vital points of the religions which they discuss.

Comparison of the religions of unlettered peoples with those of civilized and semicivilized groups is difficult. The sources are widely scattered in the writings of explorers, anthropologists and missionaries, and the collection, interpretation and organization of the materials is a labor of scholarship of which few persons are capable. Unfortunately, the reports on the religions of savages (the unlettered peoples whom anthropologists misleadingly call "primitive") present the savage concepts in terms of civilized concepts, which, in the majority of cases, do not represent the savage ones with any degree of accuracy. A typical procedure is to render a variety of savage terms, which the savages distinguish from one another by the word "soul."

A similar difficulty is encountered when Greek religion, or Egyptian religion, is studied

in translations. We might excuse translators who render nine different Greek terms for human appurtenances by the four "vagrant" English words, *soul, heart, mind, spirit*, using these four words interchangeably. These Greek words changed their meanings progressively from Homer to Plato, and the translators pay little attention to the changes. Budge, on the other hand, is less excusable, for he distinguished the meanings of the various Egyptian words for human appurtenances such as Ka, Ba, Khu, etc., but in his translations he renders them all as "soul"! The concepts of savages, however, have not changed, except under the influence of missionaries, for savage cultures have been static for centuries. If reporters and translators would transliterate terms in the original languages into a modern language and avoid translating them, confusion would be reduced to a minimum.

Books have been written on so-called "primitive" religion and on the religions of particular savage groups, but the authors of these books appear to be insufficiently oriented in the methods and principles of comparative religion. It is clear that one who writes on religions of unlettered peoples should, first of all, become acquainted with the development of the religions of civilization.

Perhaps the best source of materials on the religions of unlettered peoples is Frazer's *Golden Bough* (7). Frazer, who well knew the difficulties to be encountered in using the reports of ethnologists, explorers and missionaries, was more discriminating in his compilations than are most compilers. His theories, which he changed progressively as his work continued, are unimportant.

Among religions of semicivilized peoples, the numerous religions of India offer a problem for comparative religion which is somewhat different from the problem of savage religions. Most of the writers on Hindu religions seem naively to have accepted the Hindu traditions which ascribe great antiquity to their sacred writings. Hindu religions, however, except for those of modern sects which have been influenced by Christianity, seem little further advanced than were Greek and Levantine religions at the time of Homer (800 to 1000 B.C.). The Vedas were not actually composed until the Christian era, and Greek influence on Hindu concepts is evident. The soundest book avail-

able on Hindu religions is still that of Hopkins (8), which was published fifty years ago.

It is fortunate that for the understanding of the religions of civilized peoples a full comparative study is not necessary. Comparison of civilized religions with savage and semicivilized religions is important for the understanding of the changes which Christianity has suffered in savage areas into which it has been introduced; but in the face of the difficulties above set forth, study of the development of civilized religions from its origins in the Mediterranean, Levantine, and Celtic religions can suffice. We cannot trace civilized religion back to its really primitive stage, but we can trace it back far enough to infer to the roots of religion in the areas where civilization passed its infantile stages.

In so far as materials on Mediterranean, Levantine, and Celtic cultures and religions are available, they have been collected, analyzed and organized by scholars, and no further work remains to be done, except critical evaluation of interpretations and conclusions of the scholars, which are not always sound.

Among the compendiums available are Cook's *Zeus* (9), embodying the work of a lifetime, and Reinach's collection of essays (10). These works are not for the average reader but for the researcher. Cook's volumes are badly organized, with material distributed through text, footnotes and appendices; and Cook's conclusions are sometimes opposed by the material he presents. The postulates of "Nature-religion" are sources of some of Cook's conclusions, but his volumes are the last words in collection of data and documentation thereof. Reinach's volumes have not been translated from the French, but his French is not difficult. The volumes are revealing for some features of Judaism, and are the best available sources for Celtic religion, while his analyses of some points in Mediterranean and Levantine religions are not matched by those of Cook. Reinach depended too much on the postulates of animism and totemism, but these factors are easily eliminated by a careful reader. The materials collected so competently by Cook and Reinach can be supplemented from references 12 and 13, and the researcher will seldom need to revert to the original sources.

For the genetics of Judaism there is an abundance of material available, some of which is discriminately treated in Reinach's essays. Some

scholars, unfortunately, have obscured the problem by presenting their materials so that intelligent readers with some orientation in comparative religion and mythology can grasp the points, while veiling their conclusions in such a way as to avoid offending the orthodox groups who had supplied funds for the authors' work. Sayce (11) is an illustration of a scholar who presented conclusions which he well knew were deceptive.

On the development of Islam (Mohammedanism), material is not so abundant or so available. Books for student use give Islam scanty treatment, which might be justified on the ground that Islam is a synthetic religion in which features of Judaism and Christianity were grafted on ancient Arabian religion. Information can be obtained from the appropriate topics in the *Encyclopedia Britannica*, Eleventh Edition (12), and reprints thereof, although the rarer Ninth Edition is even better. Editions later than the fourteenth are not recommended, since the articles were written by hack-writers, while the articles in the early editions were written by scholars of eminence. The *Encyclopedia of Religion and Ethics* (13), edited by James Hastings, is also highly useful, not only for information on Islam, but also on most other topics in the field of religion. On the religions of the Southern Levant, from which early Arabian religion and Judaism evolved, the book by W. Robertson Smith (14) is still useful.

In studying the evolution of civilized religion, in addition to the cultural conditions in which it developed, the branching of religions into sects, between which there is often a greater divergence than between cults which are said to be different "religions," needs consideration. Two sects which have developed from the same stalk are still called by the name of the original parent stalk. The difference between sects and religions, in short, being one of history, not of doctrines. On the other hand, the assimilation by one "religion" of features of other "religions" must be considered. As I have said above, one cannot understand religion unless one understands its process of development.

The psychology of religion is primarily a topic in the field of group psychology, with personal psychology secondary in importance. This is evident from the principle now accepted by scholars, that faith develops from

ritual, not ritual from faith. This principle did not gain immediate acceptance when Robertson Smith proposed it, but is now considered sound. That the branching of a religion into sects is a group matter is obvious. That a religion cannot be imposed on a people unless the "new" religion assimilates ritual features and festivals of the "old" religion is commonly admitted; and this, of course, is a group matter.

Before more books are written on the psychology of religion, there should be much work done by psychologists who understand the genetic and comparative methods, especially as these methods are applied in group psychology—psychologists who are able to analyze the psychological factors which have determined the evolution of civilized religion from the earliest point in the history of civilization to which it can be traced back. Only when this has been accomplished can we evaluate the role religion can play in the future of civilization and evaluate the significance of the pathological features of religion.

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RELIGION AND PSYCHIATRY (An Approach to European Psychology of Religion).—What may be termed the last skirmish in Europe's long conflict between science and religion took place hardly a generation ago. This time the argument was between the new twentieth-century scientific psychotherapy and *Seelsorge*, as religious psychotherapy was called in German-speaking countries.

Sigmund Freud of the psychoanalytic wing of scientific psychotherapy brought into the open this controversy with an attack on religious psychotherapy and the supernaturalism with which it was so intimately bound. Branding religion as a species of superstition, yet attributing some therapeutic value to it, Freud attempted in *Die Zukunft einer illusion* (1927) to explain away religion as a grand compulsion-neurosis which gave a false sense of security by simply masking the minor neuroses of life. He saw this neurosis originating in the infantile fear of and resignation to the real father who frustrated the incestuous sexual yearnings of the little boy for his mother. In adulthood this infantile fear of and resignation to the father, now surviving in the super-ego of the adult, are reactivated in the presence of libidinous stirrings of any sort. This conception of religion as a compulsion-neurosis had been one of long standing with Freud, who first broached it as far back as 1907 in *Zwangshandlungen und Religionsübungen* and subsequently enlarged upon it in *Totem und Tabu* (1912-13). In the work of 1927 it is maintained that in the light of the marvellous advances of scientific psychotherapy, religious psychotherapy as handmaid of supernaturalism has become definitely outmoded and should go the way of all pre-scientific illusions.

In answer to this attack protagonists of religious psychotherapy sought to defend the non-illusory character and genuine psychotherapeutic value of religion. They admitted the need of a knowledge of scientific psychotherapy on the part of the modern *Seelsorger*, and they sought to enlighten their opponent with the generic in the nature of religion and *Seelsorge*.

The theologically trained religious psychologist and leading exponent of the Würzburg-inspired experimental approach to the psychology of religion, Werner Gruehn, in his *Seelsorge im Lichte der gegenwärtigen Psychologie* (1927) defined *Seelsorge* as care of the soul.

By tradition, *Seelsorge*, variously styled pastoral theology, practical theology, Christotherapy, pneumatic therapy, spiritual guidance, had signified care of the soul in the sense of spiritual consolation at the hands of clergymen officially commissioned by the church. This psychotherapy is religious in the sense that the therapeutic effects are understood by the distressed soul to flow from God, or the Savior, or the church, with the clergyman merely serving as mediator. This soul-care can be by means of physical assistance, counsel, instruction, encouragement, chastisement, interest in, understanding, confidence in, sympathy, forbearance, fighting with, living with, bearing testimony of salvation through Christ, interceding prayer. The keynote of it, according to Gruehn, is *active love*, charity, helping as we have been helped.

Gruehn would broaden the concept of *Seelsorge* beyond its traditional meaning. He would, in the first place, have *Seelsorge* retain its pneumatic or spiritual character while absorbing much of value in the way of the causation and therapy of personality disturbance from scientific psychotherapy. Too often the priceless ingredient of *Seelsorge*—namely, *charitas*—is just that which is missing in scientific psychotherapy. Without this ingredient scientific psychotherapy is but “sounding brass and tinkling cymbal.”

In the second place, Gruehn would no longer restrict the practice of *Seelsorge* to clergymen. “*Seelsorge* would embrace not only preaching, confirmation instruction, not only liturgy and mission teaching, but every assistance which one person renders another, be he physician who helps his patient, or mother who helps her child, or friend who helps friend—every assistance which is determined by deeper motives carries already spiritual guidance character in itself.” “*Seelsorge* is not merely an affair of the pastor.”

In the third place, Gruehn believes that *Seelsorge*, as he more broadly conceives it, will of necessity retain its pneumatic (i.e., spiritual) character, but that in a truly deeper sense. The God from whom all blessings flow becomes a God of Love. The disillusioned soul is led to an abiding faith in a transcendent power, to a new, relatively fruitful inner life, just through the unselfish love, the unshakable faith, hope and charity exemplified in the person of the *Seelsorger* who deals honorably with his neigh-

bor. It is in reality this new access to God that brings peace to a troubled soul. God is no longer the God of childhood fancies, but rather a living reality in the person of a true friend sorely needed. *Seelsorge* must have something more to offer the soul in distress than a better Hereafter, than “a draft on the stars.” The task of the new *Seelsorger* is that of saving souls for this world.

In the fourth place, Gruehn, in his enlargement of the meaning of *Seelsorge* to embrace all there is of value in scientific psychotherapy, sees it incumbent on the *Seelsorger* to provide himself with all the knowledge possible of general psychology, religious psychology, scientific psychotherapy, pedagogy, etc. “Who should know the human soul more than he who would help it?” What is *Seelsorge* ultimately but “psychology applied under pneumatic viewpoints.”

Very much the same point of view as that of Werner Gruehn's is set forth by Marcus Gregory in his *Psychotherapy, Scientific and Religious* (London, 1939). While lay (i.e., scientific) psychotherapy and spiritual or pneumatic psychotherapy have evolved in the past somewhat independently, there is much that is common to both, much that each can well borrow from the other. Out of this pooling of the best from each other, Gregory would see spring the *Seelsorger* of the future, who is at once God and man. “The power of the ideal healer,” according to Gregory, is dependent upon identification with the patient, and that, ultimately, is based upon the greatest gift of all—that of love. The healer who seeks apotheosis will be hated by the “gods,” but the love of the ideal healer is sure to be met with adoration.”

An actual step in the direction of enlarging the scope of *Seelsorge* in such wise as to absorb lay psychotherapy and to provide the *Seelsorger* with all possible scientific knowledge pertinent to the etiology and therapy of personal disorganization had already been taken by a branch of the Verein katholischer Akademiker in instituting three-day meetings at Kevalar in March, 1925, March, 1926, and March, 1927. At these conferences, papers were presented by physicians, theologians and pedagogues which centered around the theme, “Border Questions Between Religious and Scientific Therapeutics.” These lectures and discussions were subsequently edited and published in three volumes by

Wilhelm Bergmann under the title *Religion und Seelenleiden* (1926, 1927 and 1928). Constitutional, physiogenic and sociogenic factors in personality disturbance are set forth in a surprisingly candid fashion, and free discussion of both psychoanalytic and individual psychology methods of diagnosing and treating functional disorders is carried on in a similarly frank manner, considering that the entire program was under the auspices of the church. Most interesting of all is the frank admission of errors on the part of ecclesiastical therapists. Religious instruction is admitted as erring in imparting a naive anthropomorphic conception of God. For thousands, God remains throughout life a heartless, unsympathetic tyrant, a father more wrathful, capricious and unreasonable than their own father. Even somewhat more wholesome would be an anthropomorphic notion of God as Friend or as Mother. The notion of God as wrathful, and the dread of judgment day are conducive to anxiety and morbid conscience. Belief in the devil also promotes anxiety and at times epidemics of witchcraft. Overzealousness on the part of religious instructors and intolerance for less than perfect piety in their pupils make for morbid complexes of suspiciousness and overscrupulosity, for joylessness, lack of courage, melancholy. Encouragement to mysticism in those predisposed to hysteria is conducive to a dreamy religiosity and the latter's morbid effects; namely, hopes without prospect, morbid wishes and yearnings, autism, a fantastical living in fairyland. While the Catholic confession has at bottom psychohygienic and psychotherapeutic value as a catharsis, much of its success depends on the confessor-father, who can err from lack of scientific preparation for his role as *Seelsorger*, from lack of *Einfühlung* into the soul of the confessee, from too erotic attachment to his confessee, from fostering a morbid conscience.

Prinzhorn, Schultze-Maizier, Jaspers and Jung came with integrative solutions of the controversy which stressed the religiosity of sincere psychiatric activity and the psychiatric nature of religiosity.

Hans Prinzhorn in his *Psychotherapie* (1929) sought a common footing not only for religious psychotherapy and scientific psychotherapy but also for the various intervalling schools of scientific psychotherapy. As a philosopher of psychotherapy he sees the cause of causes of

neuroticism in an exaggerated egocentrism and the principle of principles of psychotherapy in a reduction of this egocentrism by any of several means—in fact, by any means which will take the neurotic's mind off of himself and direct it to something larger than himself, whether it be a task, the writing out of his dreams, the psychotherapist himself, a friend, society, a teacher, a priest, or God. Selfishness is abnormal. Man is normally a social animal. Ego deflation must be achieved in an as unobtrusive a manner as possible or else the neurotic will be driven back into an even more morbid egotism. Everything in this matter depends on the personality of the psychotherapist. Be he teacher, priest, physician, pastor or friend, the psychotherapist must possess, besides a comprehensive knowledge of human personality, above all else a sympathetic human understanding, a deeply rooted love—for in fact, a veritable religion of—helping a fellowman out of his difficulties without regard to pay, time consumed or the opportuneness of the distress. Prinzhorn's prescription for compounding the ideal psychotherapist reads: "One wise priest from each of the great religious communities, one lawyer, one teacher, one psychologist, one wise philosopher, and three physicians possessing a very sound biological basis."

Friedrich Schultze-Maizier, in his article "Individualpsychologie und Religion," which appeared in Wexberg's *Handbuch der Individualpsychologie* (1926), wrote prior to but in a fashion quite similar to Prinzhorn: "Individual psychology is not religion—it is a science of the human soul which would work itself out in a practical way in psychotherapy and education, in social work and *Seelsorge*. Among its cardinal tenets belongs the doctrine of the 'blind spot' of egotism, of the pathology of all self-engrossed subjectivity, and of the healing power of a courageous subduing of egotism in service to society. Just this notion of society, which stands so rightly in the focal point of individual psychology-theory and -practice, leads necessarily to religious formulations of the problem. . . ." Individual psychology does more than re-echo New Testament truth; it gives modern psychological meaning to the words, "Whosoever will lose his life for my sake, the same shall save it. For what shall it profit a man, if he shall gain the whole world, and lose his own soul?"

As early as 1919, and before the controversy had come into the open, Karl Jaspers, the cultural science psychologist and psychiatrist, had attempted an integration of *Seelsorge* and scientific psychotherapy in his *Psychologie der Weltanschauungen*. He saw the essential need of the sick soul, religious or lay, for a hold (Halt), for something on which he can absolutely rely, for something hold of as of infinite value to him. Man values in so far as he lives. Values are objectifications of the powers within man (motivational predispositions, passions). Man creates a multiplicity of values, many of which conflict. Hence the crying need is for a hierarchy of values in his life organization which alone gives, in the words of Eichele, *persönliche Zuspitzung*. Scepticism and nihilism show valuation at its lowest ebb. Finite holds, such as authoritarianism, liberalism, patriotism, are values which give man a relatively stable yet contingent satisfaction. A hold to the Infinite is the supreme value, but one which is irrational and sustained solely by the power of faith. With a hold to the Infinite the mind feels itself as infinite and free. For Jaspers the task of both scientific and religious psychotherapists would consist in helping the individual to a value hierarchy which must not be imposed from without but evoked from within.

In the light of psychoanalysis, Carl G. Jung, in *Modern Man in Search of a Soul* (1934), observes, as the chief difficulty barring the way to an entente between *Seelsorge* and scientific psychotherapy, the restriction of the term religion to some so-called orthodox, traditional faith, dead or moribund, which is imposed from without upon individuals. When the term "religion" is used to refer to a personal living faith, to a quickening enthusiasm which springs spontaneously from the individual in the interest of his soul's sanity, at once the way is cleared for *Seelsorge* and scientific psychotherapy to see eye to eye. Jung sees, in the attempt to impose traditional morals and traditional religion on the soul of man, a basic source of neurotic conflict. In imitating Christ or any other person past or present, one may lay for himself the foundation of a dissociated personality. The essential task of the psychotherapist, religious or scientific, is to guide the sick soul to a life organization of the patient's own, and this life organization must emerge out of the peculiarity of the patient's own instinctual life,

circumstanced as it is. Instead of adopting an alien, hand-me-down religion, the individual human soul must be left latitude for the origination of its own way of salvation. Only in this way is the soul permitted to exercise its spontaneous autopsychiatric (i.e., self-healing) function.

The readiness of the protagonists of religion's healing power to propose or to accept revaluations of their concepts of religion and *Seelsorge*, such as have been cited above, and to avail themselves of the gains made by scientific psychotherapy in the matter of the etiology and therapy of personality disorders, contributed not a little to the speedy termination of hostilities. The spirit of these reformulations appears to be this: In first-hand religion either peace of soul or some means thereto is transcendently, i.e., absolutely, valued by the individual, and this absolute valuation springs from a serious need on the part of the individual human soul to get a hold of itself, to recover its equilibrium, to restore its serenity. Apparently religion is conceived as stemming out of *ganzheitliche*, i.e., holistic or self-healing, tendencies of the soul itself. In something of a vitalistic sense, religion is the *vis curatrix animae* in motion. It is an act of prepotent character whereby a disturbed soul spontaneously endeavors "to regain its plumage," to right itself; in a word, to become its own *Seelsorger*. Psychotherapists, religious or scientific, merely aid this spontaneous self-healing of the soul. When the transcendently valued means to peace of soul is an all-consuming love of humanity, the religion of the individual assumes a form which makes not only for a this-worldly salvation of his own soul, but also for that of others. To some such notion of first-hand religion as this, which stresses the losing of one's soul in order to save it, and a positive soul salvation, Gruehn, Prinzhorn, Gregory, Schultze-Maizier and Jung appeared to point in their endeavor to reach an accord between secular and ecclesiastical psychotherapy. In its light the scientific psychotherapist, provided he is absolutely consecrated to his task of saving souls, becomes himself entitled to be termed a religious psychotherapist, and his exclusive devotion to the saving of souls, upon which rests ultimately his own peace of mind, fully merits the name of religion. Moreover, the patient himself is afforded a new access to God in the person of such a therapist.

The promptness with which the champions of religious psychotherapy proposed or accepted formulations of this kind can be attributed in large measure to the fact that centuries of religio-psychological inquiry in Europe had prepared the way with findings of corresponding import. From Xenophanes down, religious psychologists had defined first-hand religion in one way or another as an absolute valuation of something, with or without stipulating the nature of that something. By none was just this aspect of religion to be more brilliantly depicted than by Schleiermacher¹ (feeling of absolute dependence), Otto² (the *tremendum-fascinans* character of the holy), Stavenhagen³ (absolute attitudes), Augustin⁴ (innermost concern of an individual), and Mattiesen⁵ (self-abasement). Almost as far back in the history of European religious psychology are to be found intimations to the effect that this act of transcendently valuing something had to do in some way with the welfare of the soul, that such an act springs from a need for peace, serenity, security of the soul, that religion is at bottom a spontaneous psychohygienic, i.e., autopsychiatric, activity of the soul.

Socrates appears to have been the first among European religious psychologists to suggest a psychohygienic *raison d'être* of religion. The ultimate goal of religio-psychological yearning was in his opinion none other than the supreme good of the soul. Salvation of the soul from being carried away by the multiplicity and transiency of appearances, i.e., perceptual knowledge, he saw in a predilection for conceptual knowledge, i.e., wisdom. Salvation from being carried away by one's own desires and aversions he saw in a moderation of one's desires and aversions (i.e., in *Σωφροσύνη*). This moderation of the desires and aversions is best achieved through conceptual knowledge. Plato, his pupil, saw the goal of religio-philosophical yearning in the supreme happiness of soul attained through an inner contemplation of the ideal Good, True and Beautiful (*Phaedrus*). Religion for Aristotle had to do with the supreme good of the soul; that is, with reason's maintenance of peace of mind from the desires (*Eudemian Ethics*). Plotinus, the Neo-Platonist, discovered God, i.e., the supreme good of the soul, in the ecstatic feeling experienced during semiwaking contemplation (*Enneads*).

With the Stoics and Epicureans the connec-

tion between an absolute valuation and the soul's welfare was set forth even more explicitly. The motive to religio-ethical life they saw in the need for peace of mind, for imperturbability, for *ataraxia*, from the vexations of life within and without and particularly from the fear of death. They differed sharply as to the means, the Stoics attaching transcendent value to living in accordance with reason, the one and only way of not being carried away by appearances and by one's desires and aversions, the Epicureans claiming that peace of mind is only to be had through an exhaustive gratification of one's desires. According to Epicurus, even the gods of the people must be conceived as models of imperturbability and hence do not want to be disturbed with the complaints and petitions of human beings. Among Epicureans, Lucretius Carus (98–55 B.C.) held that true piety consists not in a cult of supernatural beings but in being able to view with calmness of mind the universe of nature and its concatenation of causes and effects. Death Lucretius regarded as a thing not to be feared but rather as something to be welcomed as affording an enduring peace "even gentler than a sleep without a dream." For Cicero, the Stoic, religion as a predisposition was a capacity and tendency to composure of mind under all circumstances whether in the contemplation of the world or in the struggle of life.

This thesis of the psychohygienic origin of religiosity is resumed from the seventeenth century onward but by none in Europe so clearly and decidedly as by Stirner, Ideler, Joly, de la Grasserie, Moerchen, Delacroix, Rank, Bergson and Spranger of the eighteenth and early twentieth centuries.

Max Stirner (Casper Schmidt, 1806–1856) in his *Der Einzige und sein Eigentum* (1845) regards the sacred as the most generic feature of religion and defines it as "everything towards which you cherish any respect or reverence." In reverence (*Ehrfurcht*) "something is not only feared but also honored: what is feared has become an inward power which I can no longer get clear of, I honor it, am captivated by it, and devoted to it, belong to it; by the honor which I pay to it I am completely in its power, and do not even attempt liberation any longer. Now I am attached to it with all the strength of faith: I believe. I and what I

revere are one; not I live but the revered lives in me!" The object revered possesses not only a fascination but also a certain foreignness. "In everything sacred there lies something 'uncanny,' i.e., strange, such as we are not quite familiar with and at home in."

This hallowing, this consecrating, this spiritualization of an object is at bottom the work of one's own Ego. Without this act of absolute valuation on the part of my Ego the object is as good as nothing. Once hallowed, the object becomes one with the Ego which hallows it. With full development of Egohood, the realization comes that at bottom the Ego hallows itself. That other Egos hallow an object means nought to me when my own Ego has attained its maturity.

Stirner sees religions differing in the object which is hallowed. Practically everything in nature or in supernature (spooks, thought-things) has been or can be held sacred by individuals. Thus a religion has been made of morality, chastity, spooks, ancestors, friends, love, reason, ideas, man, liberty, equality, communism, nature, marriage, patriotism, heroes, adultery, sex, one's vocation.

The hallowing of an object entails of necessity renunciation, sacrifice. Everyone who hallows something, no matter what, "ventures everything else for the one thing, one object, one will, one passion, etc."

As to the function of or motive to this consecration, to this enthusiasm, to this hallowing of and sacrificing to one object, Stirner believes it has, broadly speaking, to do with the welfare of the soul. Formerly it was a matter of finding a retreat for the soul from the vexations of life. With full-fledged Egohood it is a matter of securing a freedom for the soul from the thrall-dom of things alleged to be without one's power, from everything that is not you, not I—i.e., it is a matter of a self-realization of the Ego's ownership of the world. It is in self-realization that Stirner sees the ultimate salvation of the soul, i.e., of the Ego.

In Stirner's exposition of the psychogenesis and psychohygienic nature of religion is to be seen the most comprehensive formulation up to his time, if not in the whole of European religious psychology.

In *Versuch einer Theorie des religiösen Wahnsinns* (1848 and 1850) the German psy-

chiatrist, Carl Wilhelm Ideler, observed both in his patients and in the lives of the great mystics of the past a compensatory, consolatory awakening of religious passions upon the shattering of life's happiness, particularly of love—a relationship which St. Francis de Sales had noted long before: "God is just as necessary to ungratified love as water to parched lips."

Henri Joly in *Psychologie des saints* (1898) saw the motivation to and goal of the saintly life in a higher integration of the personality (i.e., in a unity or at-one-ment) of the instinctive-emotional and moral selves. In this Joly differs from his predecessors, Maine de Biran and Jouffroy, for whom the higher at-one-ment, the Stoic-like peace of mind, was to be attained only by way of a complete suppression of the instinctive-emotional or animal self and for whom the spiritual life is identified with the moral life. Joly's conception of the saintly personality has more resemblance to present-day mental hygiene's notion of the wholesome personality. The saint is distinguished by Joly from the hysterical, despite the fact that hysterical phenomena are at times found associated with saintliness. Hysteria in the saint may result from imperfect integration, from suppression of the instinctual instead of its integration with the moral self. "Sanctity is not a disintegration." It is not a "division of the personality, although it certainly creates a new personality, and that at the cost of great sacrifice and much suffering. This new personality is not a medley of divided and dismembered parts. It exhibits a cohesion, a strength and a unity above anything which psychology can show us. This new personality also retains whatever was best of the original personality and these surviving elements combine peaceably within the new."

The nineteenth century came to a close with the work by Raoul de la Grasserie entitled *De la psychologie des religions* (1899) in which two categories of religion are distinguished: the social and the psychological. By social religion he means second hand or traditional religion, the notions and practices of which are stamped by the elders upon the young generation. By psychological religion he understands first hand subjective religion which springs as an ideal consolation out of instinctive-emotional needs frustrated of their natural gratification. De la Grasserie enumerates five instinctive-emotional

needs, any one or more of which may play, when frustrated, a leading role in the psychogenesis of subjective religion, namely, the desire for security (fear), desire for equality (justice), desire for companionship (social), desire to help the less fortunate (sympathy: for some the essence of piety is pity), and the desire to love. If a strong one of these vital needs is denied natural gratification, it may find ideal gratification in phantasy as for example in an imaginary companion, lover or protector suggested already in traditional religion or else created *de novo*. Here the psychohygienic origin of religion is seen as an ideal compensation, or consolation for instinctual privation in much the same sense as Ideler had noted.

At the turn of the century the American religious psychologist and founder of functionalism, William James, gave his Gifford Lectures at the University of Edinburgh entitled, *Varieties of Religious Experience* (1901-2) in which the psychohygienic theory of the origin of first hand religion received a most hearty endorsement. Here for the first time the term "mental hygiene" is actually used in this connection. Here the psychohygienic goal of religion is seen as the only common denominator of widely differing forms of religiosity. James defines first hand religion as a "live hypothesis" whose function, whose *raison d'être* is to assist one to live a happy life and to die a happy death. "I mean by religion for a man *anything* that for *him* is a live hypothesis in that line, although it may be a dead one for any one else" (*Pluralistic Universe*). The truth and reality of a religion can only be judged from the practical psychohygienic value it has for the individual concerned, constituted and circumstanced as he alone is.

This accentuation by James of the psychohygienic function of religion, of the role of religion in life- and death-adjustment, was to give, perhaps on a less tolerant scale, a definite cast to subsequent American religious psychology.

In Europe this Jamesian thesis along with its supersectarian character is mirrored rather faithfully by F. Moerchen in *Die Psychologie der Heiligkeit* (1908). A person designated as "holy" is according to Moerchen one who has seized upon something which he feels fills or makes whole a life otherwise left void by the

general run of worldly things. This something which so devoutly absorbs this person is regarded by this person as divine in the sense of "surpassing value." This something may be love, grief, enjoyment of art, enthusiasm for an idea, etc. As long as religion fills these unsatisfied yearnings and does so better than anything else and so long as unfulfilled yearnings persist in man, religion will continue to exist. When better religions come about in the sense of better satisfying unfulfilled human yearnings and needs, these religions will replace the old. The truth-content of religion must always remain a matter of individual, subjective conviction—"a fact of consciousness."

Implications of a psychohygienic origin of religiosity are found in *Etudes d'histoire et de psychologie du mysticisme* (1908) by Henri Delacroix. Based on the lives of St. Theresa, Madame Guyon, St. Francis de Sales, John of the Cross and Heinrich Suso this study reveals that the mystic in pretending to experience God is, in psychological language, experiencing an *alter Ego*, namely, the subconscious self with its automatisms such as hallucinations, glossolalia, intuitions, inspirations and compulsions. To the mystic this *alter Ego* which takes over appears to be of external and supernatural origin. In the presence of this apparently transcendent, impersonal subconscious self the personal conscious is passive, powerless, submissive. As these subconscious automatisms become "imperative and take possession of consciousness," they bring about there a new life-core, a superior unification. Probably the best analogy to this transformation of personality is that to be seen in a person experiencing romantic love. "The 'divine' is therefore a passive power of unification and organization which at first appears alien to the conscious Ego, owing to the division of consciousness." This impersonal subconscious reveals itself in the personal consciousness, progressively invades the latter and substitutes itself for forms of action and thought which constitute the personal consciousness. "This superior power, this substantial energy, this efficacious internal law, after being opposed to the conscious Ego, now penetrates it, assimilates the latter to itself, and creates a new life: it is an edifying power."

According to Delacroix this subconscious activity is determined by certain natural disposi-

tions and is regulated by directing ideas from traditional mysticism. This ideational content consists in "germs prepared by reflective consciousness and falling on a nature ready to receive them. This content matures and flowers without the subject perceiving anything of this work of maturation: the subject sees only the commencement and the end."

In the God-experience of Oriental mystics an absolute negation of the conscious Ego and of the world, a suppression of all consciousness, is striven for. With Christian mystics all consciousness is not suppressed even in the ecstatic moment. On returning from ecstasy Christian mystics find themselves become a divine instrument, i.e., the conscious self implements the subconscious compulsion either to reexperience ecstasy through voluntary practice of asceticism, passivity, oraison or else to carry out some generous endeavor.

At the base of mysticism Delacroix sees an effort to avail oneself of this "divine" i.e., subconscious power, to retrieve a primordial spontaneity so long imprisoned and mutilated in the course of ordinary life, to live without being held in check by the manifold and conflicting demands of every day life, to lift inhibitions, to let oneself go, to attain a grand simplification of life, to bring about a narrowing of consciousness, to have one's personality unified, to resign oneself to a will greater than one's own.

In *Das Trauma der Geburt* the psychoanalyst Otto Rank, claims the motivation to religious mysticism is a yearning to restore the wholeness-state of prenatal existence in the womb. The instinctual tendency of primary significance is the will-to-wholeness which finds first its satisfaction in the womb-existence. Birth becomes the first shocking disturbance to this supremely satisfying experience of nine months "coitus" in which the unborn child, body and soul, formed a whole with the mother. Normally this birth-trauma terminates with the discovery of a new wholeness in the omnipotence of infantile narcissism. In adolescence this narcissistic wholeness is disturbed by the maturation of the sexual instinct which demands a sex-partner for a restoration of wholeness. Failure to satisfy the yearning for wholeness results among other things in a regressive longing peculiar to mystics who pine for a lost paradise

in utero matris. Thus would Rank interpret the yearning of a Tauler for a "return of the creatum to the uncreatum," of certain Sufis to be extinguished and like a drop to vanish in the "ocean of mystery," of an East Indian mystic to return to the alibidinous state of Nirvana.

Decidedly psychohygienic appear notions as to the origin of religion advanced by Henri Bergson in *Les deux sources de la morale et de la religion* (1933). Instinct is seen giving rise to a *dynamic* or *mystical* type of religion and intelligence giving rise to a *static* or *fabulatory* religion. Static religion is "a defensive reaction of nature against whatever in the exercise of intelligence might be depressing for the individual and dissolving for society." In other words the fabulatory function of the intellect furnishes a bulwark against the discouraging situations of which the intellect itself takes cognizance. This fabulatory function of intelligence works in an equilibrating fashion for the security and serenity of man and society. This static religion is hence of a mythological and philosophical character. On the other hand, dynamic or mystical religion, while equally affording security and serenity, does so through immediate intuitive experiencing of God who is in essence Love.

The cultural science psychologist, Eduard Spranger (1882-), implies a psychohygienic origin to religion. In his *Lebensformen* (1914) are distinguished six types of men (theoretic, economic, aesthetic, social, political and religious) according as one or another of these value-tendencies is dominant in the psychic constitution. The religious man values only that which can bring to his soul the highest and most permanent security and happiness. In *Die Psychologie des Jugendalters* (1924) Spranger even more broadly defines religion as "any *Lebensanschauung* in which only the individual concerned believes himself to have found the ultimate value of his life. Every life-content may move into this sphere of experience. One may hang his soul's salvation on his vocation and finally on mammonism. Psychologically all that is possible."

That the psychic imbalance of adolescence is just the soil for the germination of religiosity receives particular stress at the hands of a number of cultural science psychologists, notably Spranger,⁶ Kupky,⁷ Tumlriz,⁸ Dehn⁹ and

Eichele.¹⁰ The few threats to the tranquillity of the young child are met by a budding religious feeling of absolute dependence on his parents. Only slowly, if at all, does he come before adolescence to transfer his feeling of dependence to invisible, supermundane beings of whom he has long heard much. Hebbel's childhood discovery on the occasion of a violent thunderstorm which did severe damage to his father's estate, that his father was not lord of creation as he had believed is a much cited example of precocious transfer of the feeling of dependence from the father to a supermundane agent. Normally it is the internal storm and stress of middle adolescence when maturing value-tendencies are struggling within for ascendancy that peace of mind is only restored with the eventual hierarchical organization of the value-tendencies, i.e., with "*persönliche Zuspitzung*." Momentary enthusiasms, fanatical monoideisms precede the discovery of a more permanent road to peace of soul which according to Eichele lies in one of three general directions: 1. a return to traditional religion; 2. a fashioning of a religion of one's own; 3. a selecting from traditional religion of that which appeals to him and an ignoring of the rest. The last solution is the most common one.

In *Psychologie der Religion* which appeared in Kafka's *Handbuch der vergleichenden Psychologie* (1922) Georg Runze leans decidedly towards the belief that religion is hardly intelligible save as a concern for the health of the soul.

How is the psychohygienic theory of the origin of religion to which so many in the history of European religious psychology have given their support to be reconciled with the numerous psychopathological phenomena so frequently associated with religiosity such as hallucinations, glossolalia, stigmatization, sadism, epilepsy, hysteria, psychopathy, morbid conscience, compulsion-neurosis, self-mutilations, melancholia, delusions of grandeur, introversion, autism, dementia praecox, delusions of persecution? Does not religion drive people insane?

The Danish psychiatrist, H. I. Schou, in *Religion and Morbid Mental States* (English translation 1926) has sought here to disentangle cause and effect. Schou argues that there is little evidence to support the widespread notion that

religion drives people mad. Religious influence is assigned as a cause of insanity in only $\frac{1}{2}$ to 1 per cent of the cases in Danish "Annual Reports from the State Mental Asylums and St. Hans Hospital." In other words religious influence is very rare as a cause of insanity. The testimony of psychiatrists is cited by Schou to the effect that religion, instead of causing insanity, is in reality a safeguard against it (Oppenheim), affords comfort in adversity and reduces the danger of insanity (Krafft-Ebing), counteracts mental disturbance, depressed state of mind, and all the consequences of mental distress (Hyslop), provided the religion is a strong, true and firm faith. Of the three grand categories of mental illness—constitutional, physiogenic and psychogenic—it would be natural to expect that religion might heavily account for the production of the psychogenic but the actual fact is that even here only once in a hundred cases does that happen. Schou thinks the explanation of why so many people believe religion is a cause of insanity is in a confusion of cause and effect, in an erroneous interpretation of the fact that religious ideas are so extraordinarily frequent in the insane. Three causes are assigned by Schou for the frequency of religious ideas and experiences in the insane: 1. Traditional religious ideas imbibed from childhood at home and school, in church and confirmation-classes, at funerals and meetings, are latent in all of us. In the hour of need which is certainly the hour of psychical suffering these latent religious ideas make themselves felt. One then turns to the "old truths" for support; 2. For many people religious ideas imbibed are but a meaningless jargon, a sort of protecting charm which the sufferer stammers out in the dark night of mental disease, like a wanderer by night making the sign of the cross when he meets a ghost; 3. Mental illness reveals the total contents of the patient's consciousness, mercilessly bares the patient's soul including not just the meaningless jumble of religious ideas imbibed from traditional religion but also the primitive tendency, natural inclination, instinctive craving to religiosity which in normal times may be suppressed. Just here according to Schou is the breeding ground of religious genius.

That religiosity as a transcendent valuation of something, as an exclusive dedication of one-

self to something, as an absolute upon something is not always to be evaluated as conducive to mental health in the objective sense of that term has been recognized by a number of European religious psychologists who may or may not espouse a psychohygienic origin. Beginning perhaps with Socrates but very definitely with Lucretius, resumed many centuries later by Burton, Locke, Comte, Feuerbach, Marx, J. S. Mill, Isaac Taylor and Friedrich Nietzsche and continued into the present century by Bry, Schjelderup and Freud there has been clearly evidenced a tendency to distinguish "true" from "spurious" religious experience, not so much on the basis of their orthodoxy as on that of their psychohygienic efficacy. Accordingly, that religiosity appears to have been regarded as "true" which may be characterized as a positive consecration, i.e., one which is oriented towards objective reality, towards this world and particularly towards fellowman in some affirmative, constructive, ameliorative wise. On the other hand, that religiosity appears to have been regarded as "spurious" which may be characterized as a negative consecration, i.e., one which estranges from objective reality or which turns away from or against fellowman.

Lucretius, for example, considered belief in supernatural deities as originating in dreams and visions and ignorance of the causes of natural phenomena and adjudged reverence for such gods who have nothing whatsoever to do with the course of the world and its supreme principle of causality as not conducive to the calmness of mind which the contemplation of the universe and its concatenation of causes and effects or true piety gives.

St. Augustine gave in his *Confessions* a phenomenological description of his own religious conversion from lust of fame, of gain and of the flesh to love, humility and faith and told of his ultimate profit in peace of mind.

Robert Burton in *Anatomy of Melancholy* (1621) would distinguish as true religion that which "rears the dejected Soul of man, and amidst so many cares, miseries, persecutions which this world affords, is a sole ease, an unspeakable comfort, a sweet reposal, a light yoke, an anchor, and an Haven. It adds courage, boldness and begets generous spirits." Such a religion manifests itself in trust and gratitude. On either side of this healthy mean in religiosity

Burton in Aristotelian fashion sees standing two grand types of religious insanity: an excess of piety variously called superstition, idolatry, fanaticism, and a defect of piety called impiety, hypocrisy, libertinism, atheism. In excess-piety something actually of little consequence is so transcendently valued that demands of objective reality, of common sense and of human fellowship are entirely obscured.

John Locke (1632-1704) in Chapter XIX entitled, *Of Enthusiasm* of his *Essay Concerning Human Understanding* (1690) distinguished rational from irrational religion. The former is a love of truth for truth's sake. It is through the senses and reasoning based on sensory experience that "the eternal Father of light and fountain of all knowledge communicates to mankind that portion of truth which he has laid within the reach of their natural faculties." On the other hand it is pretended in irrational religion that knowledge of truth or God is come by in one of three ways: 1. a reliance upon authority rather than upon self-evidence or upon the force of demonstration; 2. an assuming of oneself as an authority for dictating to others and for prescribing their opinions; 3. enthusiasm, i.e., a reliance upon immediate revelation. Immediate revelation at the bottom of enthusiasm is "a far easier way for men to establish their opinions and to regulate their conduct than the tedious and not always successful labor of strict reasoning" and hence "it is no wonder that some have been very apt to pretend to revelation, and to persuade themselves that they are under the peculiar guidance of heaven in their actions and opinions, especially in those of them which they cannot account for by the ordinary methods of knowledge and principles of reason." Locke cites the manner of speaking of enthusiasts: they are sure because they are sure—and their persuasions are right because they are strong in them. These enthusiasts mistake feeling for seeing and set a greater store by the irrational than by the rational. Enthusiasm arises according to Locke in all ages in "men in whom melancholy has mixed with devotion or whose conceit of themselves has raised them into an opinion of a greater familiarity with God and a nearer admittance to his favor than is afforded to others" and "who flatter themselves with a persuasion of an immediate intercourse with the Deity, and frequent communi-

cations from the Divine Spirit." Whatever strong impulse these enthusiasts feel within them they conclude to be a call or direction from heaven and it must be obeyed as it is a commission from above.

Locke evaluates as sane only that religion which is a consecrated search for empirical truth.

Auguste Comte in *Cours de philosophie positive* (1830-1842) and in *Système de politique positive* (1851-1854), Ludwig Feuerbach in *Vorlesungen über das Wesen der Religion* (1845), Karl Marx in *Kritik der Hegelschen Rechtsphilosophie* (1844) and John Stuart Mill in *Utility of Religion* (between 1850 and 1858) distinguish as true or positive religion that which is a consecration of oneself to the amelioration of man's condition, a passion for social justice, a reverence for benefactors of humanity, and as spurious or negative religion that which is a worship of supernatural deities which are but figments of wish and phantasy. While the psychohygienic origin of religion is not expressly elaborated upon by these men, there is, however, implicit in their expositions the notion that religion is primarily concerned with the salvation of the soul. The kind of soul-salvation derived from negative religion they compare with that offered by dreams or opiates. For them positive salvation of the soul is by way of a consecration of oneself to social betterment. This kind of soul-salvation reminds not a little of the Bodhisatva-ideal of a renunciation of one's own salvation as long as there is left a single being in the world who suffers pain. For Feuerbach: "Man is to man the supreme being. Ethics is also religion"; for Karl Marx: "Man is the highest being for man" and "All conditions must be revolting in which man is debased, an enchained, an abandoned, a contemptible being"; for Mill: "The essence of religion is a strong and earnest direction of the emotions and desires towards an ideal object, recognized as of the highest excellence, and as rightfully paramount over all selfish objects of desire." For such a religious ideal Mill maintains that it is not "necessary to travel beyond the boundaries of the world which we inhabit." Such a positive religious ideal, as he sees it, is not the Epicurean "carpe diem" nor a narrow nationalism but "the idealization of our earthly life, the cultivation of a higher conception of

what it may be made." It is the cult of the positively ideal which can both exalt the feeling and ennobel conduct far better than any belief respecting the unseen powers.

Isaac Taylor (1787-1865) in his *Natural History of Enthusiasm* (1829) treats enthusiasm as a form of spurious piety. For him enthusiasm is an excessive enhancement of the value of an object by the imagination and desire. While he indicates that genuine religion involves sober enthusiasm for the realities promised in the Christian Testament, he maintains that the spurious form of enthusiasm is due neither to sobriety nor to defect of imagination but rather to an excess of imagination. Taylor characterizes the enthusiast as one in whom "the force and extravagance of the imagination is so great that it admits of no correction from even the severest lessons of experience, much less from the advices of wisdom; the enthusiast passes through life in a sort of happy somnambulism—smiling and dreaming as he goes, unconscious of whatever is fantastic: now he treads with naked feet on thorns; now plunges through depths; now verges the precipice and always preserves the same impassible serenity, and displays the same reckless hardihood." Whatever good of a psychohygienic kind comes to the individual from his monomaniacal enthusiasm may be attributed in the opinion of Taylor to the fact that "the object upon which the imagination fixes its gaze remains always unchanged and hence imparts a sort of tranquillity to the mind" and to the fact that this enthusiasm for some one object serves as "a refuge from the vexations of life."

In book after book, notably in *Also sprach Zarathustra* (1883), *Jenseits von Gut und Böse* (1886), *Zur Genealogie der Moral* (1887), *Der Wille zur Macht* (1888), Friedrich Nietzsche never wearies of driving home the distinction as he sees it between "true" and "spurious" religion. He sees all religion consisting in a sacrificial consecration to something and motivated by a will-to-power, i.e., by a craving for ego-satisfaction. Religion he defines as a case of the "altération de la personnalité," of the doubling of the personality into God and man, "when the feeling of power suddenly seizes and overwhelms a man." Nietzsche distinguishes two categories of sacrificial consecration: a positive one, namely, that to life-affirming goals; a

negative one, namely, that to life-negating goals. The former he endorses as truly conducive to the health and happiness of the soul; the latter he identifies with Christian asceticism which regards everything of this world as vanity and seeks salvation, peace elsewhere, i.e., "in nothingness ('God')." It is this anti-naturalistic kind of religion which Nietzsche downright loathes.

Christian asceticism, according to Nietzsche, is an unnatural striving on the part of the botched who are unable to triumph in life-affirming ways and who hence seek ego-satisfaction just in a morbid out-suffering of others, in peerless renunciation of life, in posing as "too good" for this world, in a holy form of debauchery. "The renouncer! What does the renouncer do? He strives for a higher world, he desires to fly farther and higher than all men of affirmation—he casts off much which would impede his flight, and many a thing which is nearest and dearest to him: he sacrifices it to his inordinate desire for altitude. This sacrificing, this casting off is now just that which becomes solely visible to him; accordingly one gives him the name of renouncer and as the latter he stands before us, wrapped in his hood and as the soul of a hairy shirt. With this effect which he makes on us, he, nevertheless, is probably satisfied: he wishes to keep concealed from us his lust, his pride, his aim to fly beyond us" (*Die fröhliche Wissenschaft* 1882).

On the other hand, Nietzsche cannot commend highly enough asceticism of a wholly other kind, a renunciation for the sake of worthwhile life-affirming goals and cites himself and his solitary consecration to the production of geniuses as an example par excellence of this kind of asceticism. Such renunciation not only brings true satisfaction to the soul but also makes possible the advance of human civilization. "I love those who do not seek beyond the stars for a reason to perish and be sacrificed but who sacrifice themselves to earth in order that earth may some day become Superman's." "I conjure you brethren, remain faithful to earth and do not believe those who speak unto you of superterrestrial hopes!" "I love him who willeth the creation of something beyond himself and then perisheth." (*Also sprach Zarathustra*.)

"Life-affirmation" does not mean for Nietzsche as it does for Albert Schweitzer a reverence for ordinary human life but rather a reverence for the choicest blossoms on the tree of life—for great men in whom the will-to-power, i.e., the life-force, comes to finest expression. "What is more harmful than any vice?—Practical sympathy for the botched and the weak—Christianity. . . ." (*Der Antichrist* 1895.)

That Nietzsche's great consecration of himself to the midwifery of genius was solely for the sake of his own soul's welfare is beautifully revealed by him in *The Great Longing*, the lines of which are here repeated:

"O my soul, now have I given thee all, and even my last possession, and all my hands have become empty by thee:—that I bade thee sing, behold, that was my last thing to give!

"That I bade thee sing,—say now, say: which of us now—oweth thanks?—Better still, however: sing unto me, sing, O my soul! And let me thank thee!"

"Thus Spake Zarathustra"

In the twentieth century there is Carl Christian Bry who points in his widely read book: *Verkappte Religionen* (1925) to a number of spurious or what he terms "disguised" religions: Esperanto, anti-alcoholism, theosophy, superman, communism, technology, youth-movement, success, anti-Semitism, Messiahship, will-training, statistics, psychoanalysis, Utopianism, environmentalism, race-hygiene, numbers, palmistry, pacifism, nudism and others. Bry maintains that these monomanias, these enthusiasms, offer, temporarily at least, a refuge, a consolation, a kind of salvation to humans who flee the struggle of life instead of fighting it out.

The Norwegian religious psychologist, Kristian Schjelderup in his *Die Askese* (1928) distinguishes three forms of mystical experience striven for by way of genuine asceticism: 1. *elevation-mysticism*; 2. *regressive introversion-mysticism*; 3. *sublimation-mysticism*. In elevation-mysticism the libido, being withdrawn from concrete outer objects and turned inwards, is transferred to an object of phantasy as exemplified in erotic dalliance with the Heavenly Bridegroom. In regressive introversion-mysticism the libido, being withdrawn from outside objects and turned inwards, regresses to the nar-

cissist stage in libido-development (*ego-libido*) as exemplified in Zen-Buddhism or in the mysticism of Angelus Silesius or else it regresses to other early stages in libido-development as seen in the mystical yearning for the scenes of one's childhood peculiar to Anker Larsen or in the Mother-yearning of Ramakrishna or in the womb-yearning of Tauler and Sufi-mystics. In sublimation-mysticism the introverted libido is chastened and re-extroverted in the form of a passion for a work of a socially beneficial nature as exemplified in religion as *charitas*, enthusiasm for social justice, etc.

While recognizing serenity of soul as the ultimate goal in all these forms of religious mysticism, Schjelderup evaluates from an objective standpoint elevation-mysticism and regressive introversion-mysticism as mental pathological and non-social. Sublimation-mysticism he views on the other hand as mentally wholesome and socially valuable. His evaluations are corroborated by the testimony of many a great mystic like John of the Cross, who after long experience with introversion-mysticism revealed that atop the summit of the mountain there is "nothing, nothing, nothing, neither grandeur, nor security, nor satisfaction, nor consolation, nor insight, neither pleasure, nor freedom, nor honor, nor knowledge, nor peace, nothing, nothing, nothing" and who found only in active charity, in checking the misery of fellow-man ultimate peace for his own soul.

Sigmund Freud's life-long contention that religion of the theistic variety is a compulsion-neurosis, an overscrupulosity, a sort of touch-piece against libidinous impulses, his position taken in *Die Zukunft einer Illusion* (1927) that such religion cures the minor neuroses of life only to leave the individual with a grand superstition and his anti-religious stand expressed in this work—namely, that now with the wonderful progress of scientific psychotherapy this outmoded supernaturalism should go the way of all prescientific nostrums must, however, not blind one to the fact that in many places in his works he endorses as truly psychohygienic an entirely different kind of religion—namely, a sublimation-religion which is a re-extroversion of the libido transformed into a passion for some socially valuable work.

From these several distinctions it appears possible to glean that forms of consecration which

evidence objective orientation (or what Bychowski¹¹ regards as a happy blend of subject-object), extroversion, *Gemeinschaftsgefühl*, life-affirmation have been evaluated as "true," i.e., mentally wholesome, while those featuring flight from reality, life-negation, immurement within oneself or within one's subconscious, introversion, estrangement from or hostility towards fellowman, morbid conscience, war against one's animal instincts, refuge in phantasy, in solitude, in meditation, in soliloquy, in memories, in utter forgetfulness, in drugs or in suicide have been evaluated as "spurious," i.e., psychopathological.

How are these "spurious," i.e., psychopathological, forms of religiosity to be reconciled with a psychohygienic theory of the origin of all religion? It appears that the evaluations themselves are to blame for this seeming paradox.

In the first place it appears that instead of evaluating religions as either "mentally wholesome" or else "psychopathological," it would be nearer the truth to speak of them as being either more or less mentally wholesome. It will be recalled that Isaac Taylor, Nietzsche, Bry and Freud expressly attributed some psychohygienic value even to the so-called "spurious" forms of religiosity. Max Stirner went so far as to claim that all forms of religiosity have to do with the welfare of the soul, some better than others.

In the second place the evaluations are in error when they confuse psychohygienic values with ethical, i.e., altruistic, values. The two kinds of values need not always coincide. Religiosity, despite its frequently altruistic manifestations and despite even at times its manifestation as a group-polarization, is at bottom a selfish, i.e., private, concern in the sense that it originates in the soul of the individual and is designed just for the good of this individual's soul. That others may benefit by or be involved in an individual's consecration of himself to something is not the thing of prime importance but rather whether this consecration like any other brings peace of mind to the individual concerned.

In the third place the most serious error in those evaluations of religions into "mentally wholesome" and "psychopathological" is their obvious onesidedness in viewing mental health exclusively from an objective standpoint, i.e.,

from the outsider's point of view. Such a bias of necessity makes for a psychohygienic devaluation of those forms of consecration which are not oriented towards objective reality and towards fellowman yet which bring unspeakable peace, happiness, serenity to the troubled soul of the individual. With such a bias one comes no closer to the true nature of religion than does the American, Henry Link, in his widely read book, *Return to Religion*, in which religion is identified with church-going and hence evaluated highly as an extroverting influence. How with such an objective bias as to the nature of mental health is one to understand save as "fools in Christ" men like John Brown and Franzos' "Taras"¹² whose holy passion for social justice required of them the sacrifice of everything ordinarily held dear.

No, mental health is an inner condition which cannot with certainty be known from outside. Psychohygienic evaluations of no matter what form of religiosity must be made not from the *Gegenstandsseite* but only with certainty from the *Ichseite*. That a conviction, a consecration, an enthusiasm is objectively oriented is wholly incidental. The thing of preeminent significance is that this or that enthusiasm—no matter whether a naive solipsism or an equally naive communism, no matter whether a materialism like behaviorism that would make a religion of denying the existence of the soul or a spiritualism like Christian Science which would make a religion of denying the existence of body—brings inward peace, serenity, happiness to one's soul and brings it better than anything else in the world.

Inasmuch as this peace of mind is an inner state, it must be subjectively experienced in order to be known. Hence immediate knowledge of it is limited to one person in the world. To the outsider is granted only a mediate knowledge of it through *Einfühlung*, i.e., intuition, provided a kinship of souls exists.

Religious persons, who alone have the immediate experience of this peace of soul, either in passivity or in activity, have been confronted with difficulty in communicating their experience to others, save in metaphors and parables. Such phenomenological descriptions as have been left us in autobiographies and confessions have revealed it as a "glorified joy," as "sweetness," as an illumination, as a restoring of the soul, as a peace that passeth all understanding,

as a flight of the soul, as a lifting of the burden, as a self-effacement, as sheer bliss, as grandeur of the soul, as the precious pearl, as the gold sack, as the Kingdom of God within, or simply as God. Plotinus¹³ compared it to the ecstasy of sex union. Meister Eckehart says that it is "the kingdom which the poorest man possesses." Ramakrishna¹⁴ likened it to "that happy state of comfort felt by a fatigued worker when, reclining on a pillow, he smokes at leisure after a hard day's toil: it is a cessation of all anxieties and worries." A Sufi text portrays the peace of Nirvana: "I have been effaced, I have vanished; nothing has remained of me. I was a drop, lost in the ocean of mystery, and now no longer do I find even this drop." For the Zen-Buddhist the realization of Buddhahood is simply the attainment of equilibrium and harmony of the soul, to the point that one remains calm and cheerful even in the raging struggle of the battlefield, that one sleeps amid the howling of the storm and that even in the presence of death one composes his most beautiful song. "Call the divine how you will, call it God, Allah, Jahweh, Brahman, call it Creator, Nature, or Substance—it is all the same: empty noise and smoke."¹⁵

This inner peace of soul has been described by those who have come by it through a reverence of nature. For example, the mystical experience of a glossolalia patient, when high up in the mountains or at other times, is reproduced in her own words by Kristian Schjelderup: "Happiness; no anxiety; absolute harmony. I no longer think—I no longer am an individual self. When one walks, one walks and it is nothing more therein than just walking. No demand, no desire is there—only the pronounced feeling of being one with everything else. In this state I am simply everything else. I am the light, I am the snow, I am what I hear."¹⁶ Strikingly similar is the experience of James Russell Lowell, expressed in his "Under the Willows":

"My soul was lost,
Gone from me like an ache, and what remained
Became a part of the universal joy.
My soul went forth, and, mingling with the tree,
Danced in the leaves; or, floating in the cloud,
Saw its white double in the stream below;
Or else, sublimed to purer ecstasy,
Dilated in the broad blue over all.

I was the wind that dappled the lush grass,
The tide that crept with coolness to its roots,
The thin-winged swallow skating on the air:
The life that gladdened *everything* was mine."

Among Christian mystics Teresa di Jesu writes: "Ecstasy has a consequence, a remarkable separation from the world, so profound, so radical, that I am unable to describe it." Yet elsewhere she says: "The feeling and sweetness in mystical ecstasy are so extraordinary that one can find nothing to compare with it. If the memory of it were to persist, the soul would always have to feel a loathing for the joys here below; hence it comes also that it thinks little of all things of the world." Madame Guyon, in *Spiritual Torrents*, writes: "But here the soul is raised, as it were, to a mountain top, from which it sees the waves rolling and tossing, without fearing their attacks; or rather it is at the bottom of the sea, where there is always tranquillity, even while the surface is agitated. The senses may suffer their sorrows, but at the center there is always the same calm tranquillity, because He who possesses it is immutable." For the more commonly quoted experiences of religious mystics one should see *Ekstatische Konfessionen* (1908), compiled by Martin Buber.

With the exception of men like St. Augustine and Max Scheler, and perhaps all those philosopher-psychologists before the twentieth century who solipsistically universalize their own immediate experience of religion, European religious psychologists have sought indirectly through *Einfühlung*, i.e., sympathetic understanding, to interpret the religious experiences of others as revealed in their confessions, autobiographies, diaries, essays, poems, conversations, answers to questionnaires, dreams and protocols of systematic introspection.

What does this mediate or immediate knowledge on the part of European religious psychologists reveal? If their many and varied insights over many centuries have any anchorage at all, it appears to be something like this: First-hand religion, whatever its phenotype, is a solemn concern of an individual for the welfare of his soul. An individual is on the threshold of religion when the question, "What shall a man give in exchange for his soul?" moves into the focal point of his concern. In a transcendent, i.e., absolute, valuation of the soul and its welfare or of some means to the welfare of the

soul appears to consist the *sine qua non* of all spontaneous God-consciousness. God or Brahma is ultimately "the soul itself which has found its own grandeur" (Otto).

To value something transcendentally, i.e., absolutely, is, according to Stavenhagen, "Absolute Stellungnahmen," to enhance the value of it to the altogether different *ganz anderes*, i.e., to the no longer comparable. This *ganz anderes* character, which an absolute valuation bestows upon its object, gives to it the appearance of being outside of the world, i.e., as being supermundane. The term *sacred*, *holy* or *divine* is reserved as a designation for the object of transcendent, i.e., absolute, valuation.

An absolute valuation evidences itself in a strange fear and fascination (Otto), in an utter reliance (Schleiermacher), in a total subordination of oneself (Prinzhorn, Mattiesen), in an innermost concern with (Augustin), in a *persönliche Zuspitzung* (Eichele), in a consecration or dedication of oneself to, in an exclusive devotion to, in a magnificent compulsion or obsession variously called an enthusiasm, a fanaticism, a monomania, a monoideism.

Religious experiences appear to differ first of all with respect to whether the soul and its welfare (idealism, spiritualism, romanticism), the means to the welfare of the soul (theism, supernaturalism, fetishism) or the indistinguishable blend of the means-end (the *unio mystica* of pantheism and religious mysticism), is the transcendentally valued object. Most common is the religious experience in which the means to the welfare of the soul is transcendentally valued and here religious experiences differ most widely as to what this means is.

Genotypically speaking, first-hand religion, according to European religious psychologists, appears to be a biopsychic function, a spontaneous psychohygienic activity of the soul for retrieving its whole-like-ness, its equilibrium, its equanimity, its autonomy, its serenity, its at-one-ment, its grandeur. Serious need for a restoration of this peace of soul, either in activity or in passivity, arises in the presence of a bewildering confusion of external impressions, insufferable oppression from without, impediments to self-realization, insurmountable obstacles, boredom, fear, anxiety, perplexity in the solution of life problems, indecision as to a course of action, the menace of instinctual tendencies, the imbalance resulting from momentary

indulgence of instinctual tendencies, frustration of some instinctual need such as sex, recognition, security, companionship or curiosity, conflict of value tendencies within one, fear of death, constitutional imbalance; in a word, personal disorganization in any quarter. Just in such an extremity the soul makes its supreme effort to save itself, to regain its equilibrium, to pacify itself, by seizing upon some means of remedying the difficulty. Somewhat in analogy to the physical equilibrium reflex, religion appears to be a psychic equilibrium reflex. The latter, like the former, is quite commonly of a spontaneous and non-voluntary character.

What in reality is valued transcendentally as a means to peace of soul varies according to the quarter from which comes the disturbance of soul and according to the experience content and constitution of the individual. It may differ even within the same individual from one period of life to another, as set forth by the Schjelderups¹⁷ in the case of Martin Luther and as is to be seen in so many Christian mystics. The intensity of the consecration appears to vary according to the psychic disturbance, blind fanaticism being the extreme.

Several types of consecration have been singled out by European religious psychologists for detailed study: Nietzsche's great mission by Augustin,¹⁸ sympathy by Max Scheler,¹⁹ the love-religion of St. Catherine of Genoa by von Hügel,²⁰ prophetic and mystical types of piety by Heiler,²¹ Mother-, Father- and Self-religions by the Schjelderups,²² hero worship by Wundt²³ and by Lange-Eichbaum,²⁴ Nirvana religion by Heiler,²⁵ stigmatization by Ewald²⁶ and by Jacobi,²⁷ wound-piety by Pfister,²⁸ conscience by Wunderle,²⁹ by Moers³⁰ and by Scheler,³¹ worship of trees and other objects of nature by Frazer,³² bride mysticism by Pfister,³³ castration by Grass,³⁴ solitude by Powys,³⁵ introversion by Pfister³⁶ and by Morel,³⁷ the messianic religiosity of Guillaume Monod by d'Allonnes,³⁸ the mysticism of Mademoiselle Vê by Flournoy,³⁹ elevation-, regressive introversion- and sublimation-mysticism by Schjelderup,⁴⁰ supernaturalism by Lévy-Bruhl,⁴¹ communism by Birkmann,⁴² by Dehn⁴³ and by Piechowski,⁴⁴ the mysticism of Jacob Boehme by Kielholz.⁴⁵

The peace of soul attained by way of these and many other forms of religiosity European religious psychologists have attributed to psychic economy, a grand simplification of life, a

restriction of the field of consciousness, diversion of attention, an insulation from inner and outer vexations of life, subordination of self to something felt as greater than oneself, de-egotization, a release of pent-up emotion, a self-realization of one's dominant yearning, alignment, psychic integration or unification of the personality, a hierarchical organization of one's value tendencies, a focalization of one's energies, finding of an engaging task, of a life directive, unburdening of one's troubles upon another, an escape, a depersonalization, i.e., a psychic going through the floor (Reik), retreat to solitude from the outer vexations of life, an overcompensation or reaction formation, consolation from substitute satisfactions, abreaction, catharsis, sublimation, a triumphing of love-over aggression-tendencies within one, allowing of subconscious to take over. In superstition, fetishism and supernaturalism, unlimited virtues may be imputed to the object of reverence, and these virtues may in turn work autosuggestively upon the individual in much the same way that the composure and confidence of the African boy is assured him against crocodiles by some amulet about his neck. While the lion's share in the pacification of the soul goes to the mere psychic polarization involved in the act itself of consecration, some credit is due to the fact that the consecration itself is directed often towards a removal of the source of disturbance.

The reality character of a religion derives from the peace of soul which the individual concerned subjectively experiences. According to Kant, in his *Kritik der praktischen Vernunft* (1788) and H. Maier, in his *Psychologie des emotionalen Denkens* (1910), it is in the spiritual dimension of reality that the ultimate criterion of truth is the satisfyingness of anything to the soul's sincere craving. There is something quite pertinent in the German word for satisfaction, namely, *Befriedigung*, which literally means pacification or bringing of peace. A religion which brings peace of soul to one individual may prove not only unreal, i.e., valueless, but psychically injurious when imposed upon another individual. Carl G. Jung has rightly called attention to the psychic disturbance in the form of mental conflict which may result from imitating Jesus Christ. Eichele has cited a somewhat less injurious yet incompatible outcome in adolescents who, while outwardly conforming and assenting to religious views of those

about them, possess nevertheless a secret religious life of their own. Obviously each individual has to be left alone for his soul to work out its own salvation, in so far as that does not prove a source of real harm to others. This appears to be consonant with the truer meaning of religious freedom, of religious tolerance.

To consider religion as peculiar to an earlier stage in man's cultural evolution, as a stage which has been now definitely transcended, as does Lévy-Bruhl in all his works, is to evidence a shocking lack of familiarity with the genotypical in religion. Obviously Lévy-Bruhl and, shall we say, Comte and Freud have in mind a phenotype of religion; namely, supernaturalism wherein a man's soul salvation is derived from supplicating allegedly supermundane agencies. As has been gleaned, many varieties of religion have been evolved as ways to the salvation of the soul, of which supernaturalistic ones may justly be considered among the more primitive. From an evolutionary standpoint religiosity assumes, in the most highly civilized of men today, forms which have little outward resemblance to its more primitive manifestations. Max Stirner aptly compared the phenotypes of religion to the skins of a snake; as soon as the snake-skin of the old religion is shed, a new religious snake-skin takes its place. Carl G. Jung has put the matter this way: "The living spirit grows and even outgrows its earlier forms of expression. The living spirit is eternally renewed and pursues its goal in manifold and inconceivable ways throughout the history of mankind. Measured against it, the names and forms which men have given it mean little enough; they are only the changing leaves and blossoms on the stem of the eternal tree" ("Modern Man in Search of a Soul"). What appears to be perennial in religion is the need for peace of soul; what is ephemeral is the means to that end. At higher evolutionary stages of religion the unconditional means to peace of soul has been found in a love for the brother whom one hath seen; God has become man. Nietzsche's observation, "the profoundest misunderstanding of religion: 'evil persons have no religion,'" is no less a fact than its paraphrase, "the profoundest misunderstanding of religion: 'persons who do not reverence supermundane beings have no religion.'"

The newer religions, which bring soul salva-

tion through a love to others, have the double advantage of peace to the soul of the individual and of positive benefits to others. In them "man gets his salvation," according to Ramakrishna, "when his egoism dies." With religious maturity so many Christian mystics got their salvation, as Schjelderup has pointed out, in what they themselves have termed "spiritual marriage," i.e., in a consecration of themselves to works of charity.

The singular thing is that so many of those professing Christianity have not arrived at the religious maturity called for, i.e., at obtaining peace of soul through some form of love to others. Rather, these may remain stuck in more primitive forms of religiosity, having little or incidental connection with the neighbor-love principle of Christianity. These make a maze of superstition, fetishism, emotional release (getting happy), stigmatization, baptisms, circumcision, castration, flagellation, world flight, hermit life, speaking in tongues, the wounds of Christ, relics, repentance, persecution of Jews, pilgrimage to the Holy Land, papistry, Jesuitism, witch persecution, Holy Warring, inquisitorial sadism, imaginary sex relations with Jesus, polygamy, celibacy, asceticism, survival after death, communication with the ghosts of the departed, icons, lambs, doves, Mary, the infant Jesus, theophagy, supernaturalism.

Whether the means fervently resorted to by the soul for the sake of its welfare be adjudged high or low on an evolutionary scale appears after all to be of secondary moment as long as whatever this means happens to be pacifies the soul of the individual and does it better than anything else. At bottom, religion appears first, last and always to be an effort on the part of the soul to preserve its composure, whether in the struggle of life or in the face of death.

Such appears in brief to be the interpretation of religion which has run through centuries of religio-psychological inquiry in Europe. For ages denounced as heretical, atheistic, anti-religious on account of its leaning towards a this-world salvation of the soul, and on account of its scepticism with respect to supernaturalism being the exclusive means to such salvation, this psychohygienic interpretation of religion received scant recognition of a positive kind until the twentieth century, with the scientific undermining of supernaturalism, with the over-

coming of medico-psychological materialism, and ultimately with the *rapprochement* of Seel-sorge and the new scientific psychotherapy.

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NOTES

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REMEDIAL READING.—*History.* The latter part of the nineteenth century marked the consideration of reading in a new light. Laboratory experiments were carried on in the fields of perception, eye movements, reading hygiene, eye-ear-voice relationships, inner speech, rate, and comprehension.

From 1910 to the present, increasing emphasis has been placed on the educational importance of reading. Laboratory experiments *per se* gave way to investigations carried on for a definite educational purpose. Standardized group and individual reading tests were developed and used extensively. Experimentation revealing important differences between the techniques employed in silent reading and those used in oral reading led to emphasis upon training in silent reading for elementary school children. Consideration of the importance of individual differences in all aspects of the learning experience resulted in individualization of reading instruction.

An outcome of laboratory and classroom analyses of the reading process was an interest in the types of reading disability and their diagnosis. Remedial programs have been developed to correct deficiency in comprehension, rate of reading, eye movements, and vocabulary. Reading clinics are in operation in ele-

mentary schools, high schools, and colleges, where individualized remedial training is given. In many schools a combination of individual and group instruction is used at these three levels, which provides for progress of the individual according to his ability.

Indicative of the great increase in interest in reading techniques instruction and remedial work is the fact that since 1911 over two thousand studies have been made in the field of reading.

BASIC PRINCIPLES

There are certain principles upon which current undertakings in remedial reading are based. They are an outgrowth of experimentation and analysis in the fields of physiology, psychology, and education.

1. Examinations to determine the nature of the reading disability precede treatment for the apparent reading deficiency. Diagnosis reveals the cause and type of disability.

2. Before a remedial program is designed for the individual, there is a study of his total personality, including intelligence, educational history, physical and emotional condition, and family background.

3. Whether the remedial program be constructed for the individual or for a group, it is flexible and personalized so that the pupil may be motivated and instructed according to the level of his ability and the nature of his reading disability.

4. The pupil is motivated by an understanding of the purpose of the remedial instruction, by knowledge of his progress, and by a point of view which leads him to approach the undertaking not as a discipline or a punishment but as an interesting experience.

EXPERIMENTAL WORK

Perception. The discovery by Valentius in 1844 that the reader perceives three or four letters simultaneously was followed by experiments by Cattell (1885) proving that words are perceived as wholes and not by letters. Erdmann and Dodge (1897) showed that words can be recognized when the individual letters are too small to be identified or when parts of the word are out of the range of clear vision. They reported that there is no perception during eye movements.

Eye Movements. Javal and Lamare (1879) first recorded the observation that the eye moves across the page by little jerks instead of moving continuously. Dodge (1898) constructed a camera with which eye movements were photographed. Several investigators built cameras similar to the one first used by Dodge, but the construction of the portable binocular eye-movement camera in 1932, built by C. C. Taylor and J. Y. Taylor, brought radical changes in the study of eye movements. The films show regressions, return sweeps from the end of one line to the beginning of the next, the length and number of fixations or pauses, as well as such disorders of the eye as strabismus and nystagmus.

Inner Speech. Huey (1898) studied the tendency in silent reading to articulate the words as they are read, and concluded that vocalization tended to interfere with efficient and rapid silent reading. Studies by Pintner (1913), C. T. Gray (1913), and others confirmed Huey's conclusions that articulation in silent reading is a common habit but not necessary.

Rate and Comprehension. Analyses of the relation of reading rate to comprehension accompanied the construction and widespread use of standardized silent and oral reading tests from 1911 to 1930. It was found that the rate of reading varies with the purpose for which the material is read, the content of the material, and the level of difficulty of the vocabulary used in the material. C. T. Gray (1917) showed that the most efficient reading is not necessarily the most rapid. Peters (1917) and others reported that speed drills for elementary school children resulted in increased rate of reading without an appreciable loss in comprehension.

General. Of great value to the students of remedial reading have been the studies in the fields of motivation, learning, maturation, habit formation, emotion, and mental hygiene.

APPLICATIONS

The wide range of experimentation in the field of reading during the twentieth century led to the realization that remedial programs could be devised at all educational levels, and that failures in various academic subjects might be traceable to inefficient reading habits. Not only is attention given to the cases of extreme

reading difficulty, but also to individuals in elementary school, high school, and college who lack average proficiency in reading. Concomitant with diagnosis and treatment of reading inefficiencies is instruction in study habits.

Diagnosis of an individual's reading difficulty includes examinations to determine visual acuity, general physical and emotional condition, mental age, and intelligence quotient, as well as the nature of the reading deficiency. Treatment is arranged on the basis of these findings, and emphasis is put upon arousing the pupil's interest in reading by selecting materials at his reading level which also fit in with his interests and activities. Whether group or individualized training is used, the evaluation of progress is based upon the known facts concerning the pupil.

The importance of perception in reading and the understanding of the purpose for which the material is read are taken into consideration in developing in the pupil understandings of sentence, paragraph, and chapter structure. Flash cards and word lists are used to increase the pupil's vocabulary, and experience is provided in determining the meaning of an unfamiliar word by studying it in context.

Studies of the photographs of eye movements resulted in the belief that rhythmic movements with relatively few fixations indicated efficient reading. Such devices to facilitate even, smooth reading, as slides, motion pictures, and the metron-o-scope, have been used successfully. They enable the instructor to control the speed of reading and help the pupil to form the habit of regular eye movements and to break the habit of vocalization.

The evidence from experimentation that poor silent reading is often accompanied by poor oral reading has led to the use of various oral reading tests as a diagnostic technique to discover tendencies toward reversals of letters and words, omissions, addition of syllables, misunderstanding of punctuation, and vocabulary limitations.

TRENDS

Experimentation in the field of reading has established proof of the fundamental nature of the reading process and of the possibility of remedying deficiencies in reading rate and comprehension. Specialists are engaged in continued

research and experimentation to refine procedures of diagnosis and treatment. Standardized diagnostic and reading tests are under scrutiny. Studies are being made to determine the relative value of different types of group remedial programs. The advantages and disadvantages of individual remedial programs are being enumerated and weighed. The complexity of causes of many reading difficulties is recognized and the aid of psychiatrists, social workers, psychologists, oculists, and medical doctors is being sought in order to improve diagnostic and remedial techniques. Resulting from data presented by specialists in these fields is experimentation with different types of book formats, lighting, and teaching methods. In pre-service and in-service training of teachers, instruction is provided to increase the probability of detecting early the retardation in reading ability, thereby preventing the development of inefficient reading habits or of unfavorable attitudes toward reading.

APPLICATIONS OF THE KNOWLEDGE

The accumulated information about reading disabilities has led to certain important applications. Evidence that reading disability may be due to defective vision caused by glandular disturbances, contagious diseases, etc., has led to emphasis on the importance of periodic medical examinations, including thorough tests of visual acuity. Analyses of the success or failure of numerous remedial programs have substantiated the findings of psychologists regarding the significance of the pupil's emotional and attitudinal set in a learning situation. They have also indicated strongly the importance of the personality factor in teacher-pupil relationships. It has become evident that much remedial work would be unnecessary if reading were well taught in the primary grades and if the more complicated reading techniques (skimming, reading for appreciation, analysis, etc.) were explained and practiced at suitable grade levels. Case studies have shown that the difficulty with reading may be a cause of a variety of personality maladjustments or a result of emotional disturbances. These facts have reinforced the thesis of psychiatrists and psychologists that the child functions as a whole, a composite of emotions, attitudes, abilities, in any learning situation, and that his education

cannot be thought of as an isolated experience distinct from his home life or his play life.

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RORSCHACH METHOD.—I. **METHODOLOGICAL CONSIDERATIONS.** A general description of the Rorschach method and its background has been adequately given in a preceding article.* Dr. Symonds has distinguished between the unstructured projective techniques, which are best suited for formal analysis, and the structured techniques which lend themselves more to content interpretation (cf. Symonds, pp. 583-589). The Rorschach method is certainly best known for its adaptability to formal interpretation, but content analysis is increasingly recognized as an integral part of Rorschach interpretation. The Rorschach method may be said to fall midway between structured and unstructured techniques.

It is not accidental that Rorschach paid more attention to the formal aspects of the inkblots and the way people respond to them. During ten years of experimentation he carefully chose the stimulus material in such a way that the formal aspects could be systematically delineated. The semi-structured quality of the blots, as contrasted, for example, with cloud pictures, consists in their quasi-symmetry and in the careful distribution of the stimulus material. There is a deliberate variation in the compactness of the blots, for example, in the use of color and shading and in the ease with which they lend themselves to a reversal of figure and ground. Cloud pictures in comparison lack these elements of structuralization which increase the meaningfulness of the blot material and hence the significance of the content of responses. And while there is a growing interest in the formal analysis of responses to the Thematic

Apperception Test, the task is more difficult than in the Rorschach test because the extreme meaningfulness of the figures focuses attention on the corresponding meaning of the stories.

II. PERSONALITY ASPECTS REVEALED IN RORSCHACH RESPONSES

A. *The Qualitative Aspect of Intellectual Functioning.* The results of psychometric tests such as the Basil Age and Scatter—the specific successes and failures on these tests—very often become more meaningful when considered in conjunction with Rorschach findings. The quality of intellectual functioning is determined in the Rorschach method mainly from the particular blot areas selected for responses, the manner of organization, degree of accuracy, and degree of specificity of concepts perceived. (Cf. paper by Klopfer and Davidson [3], where the authors describe how the distribution of W's and D's and the form level of a record offer valuable information regarding intellectual functioning.)

(1) With Subjects of superior intelligence, the Rorschach method shows, for example, whether thinking is more inductive or deductive. It becomes apparent if a Subject uses his best capacities or attempts what he is least able to do, as, for example, when a person gifted for detailed observation and precision work wastes his energies in an abstract or generalizing approach. The Rorschach material shows to what extent creative impulses are developed or suppressed, and whether the Subject uses them to enrich thinking or lets himself be carried away by them to the detriment of logical reasoning.

(2) At a low average intellectual level, Rorschach evidence may answer the important question of whether the poor performance is due to a general limitation of capacity or to a one-sided intellectual development, which is often a contributing factor in reading difficulties. Infantilism may show up as the condition interfering with intellectual development, or a severe emotional disturbance for which intellectual functioning serves as a battleground. In other cases poor intellectual performance may be attributed to mental deterioration resulting either from an organic process or from progressive loss of intellectual and emotional contact with reality.

B. *Emotional Functioning of Personality.*

* See PROJECTIVE TECHNIQUES.

Rorschach factors revealing the emotional aspects of personality are, first, the color and shading effects, which may be considered as the "affect-airing" stimuli, and second, the tendencies to enliven the blot material by seeing action or life, dynamic elements in the responses which reflect the dynamic inner impulses of instinct and creative self-expression.

(1) *Affectivity and Forms of Impulse Control.* The method makes it possible to distinguish the prevailing forms of impulse control in an individual or in groups. The neurotic effects of early repressions are fairly easily recognized. The suppressive efforts which represent a restriction of emotional spontaneity by conscious control will be shown in a concentration of the Subject's interests on the formal aspects of the blot material. Control through inner stability will be indicated by a rational inner life with the capacity to draw upon creative impulses for enrichment, integration, and stabilization. Outer control may be indicated by a smooth "persona," the ability to permit oneself to respond emotionally to stimuli from the outer world without losing one's head.

The desire for belonging, closeness, and affection, the role of bodily expression in inter-human contact, are reflected in remarkable detail in the responses to shading effects in the blots. The anxieties and insecurities frequently associated with this area of emotional life may be vividly projected.

(2) *Adjustment and Maturity.* The maturity of a Subject and the quality of his adjustment are determined by weighing Rorschach signs of balance against signs of insecurity and anxiety. Anxiety which has not been systematized within a compulsive or hysterical pattern of adjustment is often manifested through direct expressions of uncertainty and doubt, through evasive, non-committal responses to the blots, including vague impersonal content. Responses to the diffuse shading stimuli are particular anxiety indicators. Intellectual functioning shows the influence of anxiety through compulsive features such as a need to generalize or to cover every aspect of the stimulus situation, over-emphasis on accuracy and preoccupation with small details. Anxiety underlies the lessening of control which frequently appears when a Subject is confronted with the brightly colored or heavily shaded blots. Particular concern about the Subject's body is betrayed by a tendency to give

anatomy responses, especially under the impact of affective stimulation.

There are several Rorschach signs which have proved to be essential for good, mature adjustment in our culture. First, are the responses combining form and shading, the so-called "shock-absorbers" which reflect a capacity for differentiated rather than rigid intellectual control. Second, is some perception of human movement for stabilization and maturity; and the incidence of such responses should be greater than that of animal movement answers, which represent a more primitive, infantile level of reaction. Some texture and some color responses are further essentials, as they represent some awareness of nuances in the environment and some affective self-expression. Finally, good adjustment and maturity call for a moderately balanced distribution of attention over generalities and details, except where a one-sided approach is clearly the result of a natural gift.

(3) *Dynamics of Affective Responses to Outside Stimuli.* The way in which a Subject reacts to color in the blots reflects the dynamics of his reactions to emotional stimulation from the world around him. Impulsiveness or shyness and withdrawing tendencies, submissiveness or aggressive, self-assertive tendencies will be projected in the quality of his color responses, avoidance of color, the content, and especially the sequence of his reactions. For example, he may give first an explosive color-dominated answer and then avoid the colored areas or any further use of color. Or there may be initial avoidance and a gradual thawing out with the only use of color in the last one or two cards. The Subject who is afraid to show strong feelings and dares to express his emotions only in a controlled way will give mostly form-dominated color answers (in which the association is with a specific shape and the color is an additional stimulus); or he may prefer to use the cool gray and white or the surface texture effects. The self-centered, highly affective person whose feelings spill out either passively or aggressively with little restraint or regard for social controls will give associations based more on color than form. Such color-dominated answers represent one of the best indications of hysterical traits.

In general, neurotic or emotionally disturbed Subjects respond to the color elements in the blots with marked emotional discomfort; they

may be baffled by the presence of the color and try to avoid it, or react to it in an excited, tense manner. In contrast, both the extremely well-adjusted individual and the psychotic rarely show any such discomfort in dealing with color. The psychotic may not respond to the color at all, or may use it in a peculiar, bizarre manner, but he will not be subjectively disturbed by it.

(4) *Dynamics of Inner Life.* The specific contents of a Subject's fantasy life are more clearly revealed through techniques like the Thematic Apperception Test than through the Rorschach. However, the general role which fantasy activity plays in the thinking and feeling of the Subject reveals itself quite easily in his Rorschach record. The more "promptings from within" are accepted as a valuable or even creative contribution to his thinking the more the Subject permits the inkblots to take on action—human, animal, or inanimate. The meticulous, over matter-of-fact mind frequently shows a suspicious attitude toward any concept not entirely under rational control and is correspondingly loath to project any action into the blots.

The responses projecting human-like action reflect a person's fantasy and the nature of his attitudes toward his role in life and his relationships with others. Up to eight years of age, action elements are almost entirely limited to animals, partly for reasons of intellectual maturation and partly for reasons of emotional development. In an adult the number and quality of animal-movement answers mirror the Subject's way of expressing or repressing the "promptings from within," known as "instinctive drives" or "animal impulses." If these impulses are not accepted as a valuable, functioning part of the personality, but are felt within the Subject as unintegrated, hostile, autonomous forces, he tends to envisage inanimate movement in the inkblots. The anticipation of conflict between the goals of instinctual needs and the demands of the environment seems frequently to be indicated by the projection of such inanimate movement, of abstract forces over which the Subject has no control.

III. AREAS OF APPLICATION

If the Rorschach method is taken for granted as reliable and generally trustworthy it is not hard to see where it can be useful.

A. It has been applied most extensively in the field of psychology for differential diagnosis, to distinguish between neurosis and psychosis, and to identify the various types of mental disorders. Rorschach responses have been found to reflect the implications of somatic difficulties ranging from the severe interference with personality functioning caused by cortical lesions of the central nervous system, through the more indistinct effects of subcortical disturbances like encephalitis and cerebral palsy or ideopathic epilepsy, to the intricate, interwoven factors associated with the psychosomatic disorders.

From a therapeutic point of view the Rorschach method is useful for prognosis and treatment planning. It can answer questions regarding whether a Subject is analyzable, what may be the effects of shock treatment on a psychotic patient, or what is the possibility of alleviating somatic symptoms through psychotherapy.

In research the method is being applied to such problems as whether there is an "epileptic personality," and whether certain personality types are prone to accidents or certain illnesses.

B. In the field of child development and child guidance the Rorschach method is increasingly useful. For longitudinal studies of personality development it is of particular value at the early pre-school stage when verbalization and introspection are limited. In guidance programs it is an efficient adjunct to psychometric techniques. The method, when used like an X-ray to investigate the structural underpinning of observable behavior, may show, for example, that marked behavior disturbances are not paralleled by equally serious disturbance underneath, while mild surface disorders may prove to be the early symptoms of organic pathology. (The problem of incipient schizophrenia is one of the plagues of child guidance agencies.)

C. *Social Work.* Many of the same problems confront social work agencies and there too the Rorschach method is being applied more and more as an aid in their solution (cf. 4). In particular it is of service in distinguishing the cases where difficulties in social adjustment are mainly the repercussions of personal maladjustment from the cases where some manipulation of the environment might suffice to allow the people to help themselves.

D. *Vacational Guidance and Rehabilitation.* While the Rorschach method cannot be used as a mechanical scaling device to find out what

kind of jobs people are fitted for, in an individual guidance situation it is very valuable in conjunction with the usual tools of vocational guidance, such as interest blanks and aptitude tests. The results of such tests may be better understood and applied when they are related to the specific strong or weak points of an individual's intellectual and emotional make-up as revealed in a Rorschach test. Personality characteristics which are favorable or unfavorable for success in a particular job may be pointed out on the basis of Rorschach findings.

E. *Personnel Work*. In the application of the Rorschach method to personnel problems, striking successes have been achieved in the selection of personnel and in cutting down turnover when the examiner has been able to combine his detailed picture of the applicant with a detailed knowledge of the job situation. Attempts to delineate Rorschach signs as a screening device for particular types of jobs have proved unsuccessful.

F. *Anthropology and Sociology*. Anthropologists and sociologists have experimented with the Rorschach technique and demonstrated its value as an instrument for comparative group study (cf. 2). In *The People of Alor*, Oberholzer made the first thoroughly systematic use of the method in anthropological research (1). The culture-free nature of the test becomes apparent as it yields results even from Subjects

of non-literate cultures. The meaning of the personality aspects revealed by the Rorschach in terms of actual behavior is, of course, modified by the cultural situation. For example, in a comparative investigation of five American Indian tribes, it appeared that the Zunis were particularly different from the other tribes in their extreme reliance upon inner resources and their complete absence of any desire for conquest. These characteristics are historically illustrated by the fact that the Zunis were so anxious to keep out of intimate contact with other human beings that they moved to the top of a mesa where living conditions were considerably more difficult.

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S

SEMANTICS, LANGUAGE.—**Sec. 1. Complex Nature of Language.** The word *semantics*, created by Bréal, is used in three senses. In the first sense, for which Locke and De Saussure use the term *semiology* and the Americans rather *semiotics*, it is the study of signs in general, such as writing, the alphabet of the mutes, symbolic rites, heraldics, military signals, etc. In the second sense (in which L. Bloomfield uses it), it is the study of *meaning* in language; that is, of the semantic value of grammatical and lexical units. In the third sense (which is the traditional one, starting with Bréal, *Revue des Deux-Mondes*, June 15, 1897), it includes only one section of language; that is, lexicon. Here we shall use the term *semantics* in the second sense.

Language, however, is not only a branch of semantics; it is much more than a mere medium of communication between men; it is also a means of expression, and, as such, it is art, as we shall see.

Language, like all social or "moral" phenomena (as the Italians say) which deal with man, is a very complex fact. It offers many complicated problems which we do not yet completely understand. Several conflicting theories exist about them. In linguistics we are very far from the precision which can be attained in the physical sciences and even (though to a lesser degree) in the biological sciences. We can foresee an eclipse with a certain degree of exactitude; it is very difficult, although not at all impossible, to foresee changes in language with a certain amount of probability. This is, however, the case, and even to a much greater extent with the other social sciences, such as political history, sociology, law, and literature. Compared with these, the achievements of linguistics strike us as remarkable.

Sec. 2. Two Elements of Language: Sound and Meaning. Language is, as we have seen, the principal means by which men express themselves and communicate with each other; it is therefore symbolical; that is to say, it consists of two elements: the signifier (the material,

audible element of sound) and the signified (the thought, feeling, wish or idea we express or we want to express by means of the sounds). The first one remains within the realm of matter; it belongs essentially to the physical and physiological world and follows its rules; but the second one plunges deeply into the mysterious soul of man and reflects his life with all its desires, doubts, feelings, artistic cravings, and logical thought. It is obvious that, strictly speaking, only the second one can be of interest to psychologists, and therefore will be the only one with which we will deal in this article. It must be stressed, however, that this separation is to a certain extent an arbitrary one, for there is no language without a material (phonic) means of transmission, and at the same time there is no language without something to transmit or express. Words without meanings are not words, they are mere *flatus vocis*; nor does meaning alone make up a word. The two elements of language are closely connected, nay are absolutely inseparable, and it is evident that they react upon each other. The material, phonic shape of the word frequently modifies the meaning, and inversely the meaning sometimes modifies the word. But language consists of both: if there were no material way of transmitting thoughts or feelings through words and sentences, linguistics would be the same thing as psychology, and there would be no independent science of linguistics. It is precisely this duality which is the characteristic of linguistics and which distinguishes it from every other branch of study. (Cf. Dauzat, *Essai de méthode ling.*, p. 19; Hjelmslev, *Principes*, pp. 94 f.)

Sec. 3. The Material Form of the Word Causes the Change. The change of a word may be caused by its material form. I will give here some examples to illustrate this important point. Gilliéron has proved in a famous book that the 'bee' presents an enormous variety of different names in Northern France (*é, essaim, ruche, apier, avette, mouche, mouchette, mouche à miel, abeille, essette, jeune, alouette, oiseles, wes, uespa*, etc.), whereas in Southern France

we find everywhere the form *abelho* (from Latin *apicula*) with a few insignificant phonologic variations. The reason is, as Gilliéron brilliantly demonstrated, that the south of France had in the Latin epoch *apicula*, the north *apis*; the latter form, because of the phonologic decay characteristic of Northern France, became monosyllabic (*é*). Now, language tends to eliminate monosyllables, especially if they present few consonantic elements, because they are not clear enough, and can easily be drowned in the whole of the sentence, giving occasion for misunderstandings. But *apicula* in the south, although reduced to *abelho*, remained clear enough, and even penetrated finally into Northern France. *Abeille* (from *abelho*) is now the Parisian form, and has entered into the standard language.

In this case, as in many others studied by Gilliéron and other scholars, it is exclusively the material, phonic form, the body of the word which produced the change: the meaning of the word *apis* ('bee') had nothing to do with it. It is not because bees were more or less frequent in Northern France than elsewhere, or because they were more or less productive or important, or for any other reason of the kind, that the word *apis* was replaced; it is only because it was too short. The meaning was not the cause of the linguistic change. The same thing happened to many other words which have no connection whatsoever with the 'bee.' Of course the human mind also played a part in this process indirectly, because it became aware (more or less consciously) of the confusion, and selected other words; but the whole process started from the material fact that the word was too short, not from its signification.

The same is true for *homonymy*, which (as Gilliéron has shown beyond any possible doubt) has eliminated many words from the French language, and replaced them with others. Therefore it is only in those places where it would have coincided exactly in form with *molere* 'to grind' that *mulgere* 'to milk' disappeared (replaced by *traire* from the Latin *trahere* and other words); where there was no danger of confusion, the two words lived peacefully near each other (and so do the corresponding words, e.g., in German, in English, etc.). The same is true for 'cat' (*gattus*) and 'rooster' (*gallus*) in Gascony (where both would have become *gat*), for 'ear of corn' (Latin *spica*) and 'thorn'

(*spina*), for 'dog' (*canis*) and 'cat' (*cattus*) etc., in other regions of France; one or even both words disappeared, but only in those regions where the confusion existed; nor did it disappear in other languages, where conditions were different. In this case, as in others, language becomes a system, with its interior logic and development independent, to a certain extent, from the human will and human mind; that is, from its meaning.

Sec. 4. *The Meaning of the Word Causes the Change.* An example of the opposite phenomenon is the following. If we look at map No. 10 of the Linguistic Atlas of Italy (*Atlante italo-svizzero*), indicating the words meaning 'big' (French *grand*, German *gross*), we will immediately notice that, apart from Sardinia (which has forms representing Latin *magnus*), all regions have forms corresponding to Latin *grandis*, with only a few exceptions in Rhaetia and central Italy (*karšius*, *grosso*); it is a very uniform, monotonous map. But if we pass to map No. 39, showing forms meaning 'little' (French *petit*, German *klein*) we will find a vastly different picture with a great variety of forms. Sardinia has *minore*, *piòku*, *pittiu*, *pittikku*, etc.; Sicily, *ppiètriddu*, *niku*, *pièttitu*, etc.; Campania, *tsiku*, *pièttulu*, *paèttari*, etc.; Latium, *dzigo*, *ècuò*, *ppikkulu*; Tuscany, *piccolo*, *piccino*, *sikku*; Emilia, *cine*, *èek*, *sney*, etc.; Venetia, *èeo*, *pikoyo*, *péyco*, *masa*, etc.; Piedmont, *èit*, *pitodo*, *pši*, etc. Even more characteristic is the opposition between 'man' (maps Nos. 47, 181, 182) *uomo*, *uòmini*, and 'child' (*bambino*: maps Nos. 40, 42, 43) or *boy* (*ragazzo*: maps. Nos. 44, 45) or even 'young man' (*giovannotto*: map No. 46). While the words for 'man' constantly, without any exception, represent phonetically Latin *homō*, the words for 'child,' 'boy,' and 'young man' present a tremendous variety, dozens of forms of different origin. The same holds true if we compare the various Romance languages with each other: Italian *uomo*, French *homme*, Spanish *hombre*, Portuguese *home* go back to the Latin *homō* (or to the accusative *hominem*); but Italian *bambino* (*putelo*, etc.), French *enfant*, Spanish *niño*, Portuguese *meninho*, *criança*, and Italian *ragazzo*, French *garçon*, etc. (cf. the Atlas ling. de la France), Spanish *muchacho*, Portuguese *rapaz* are of different (and in general recent) origin. Cf. likewise Italian *grande*, Spanish *grande*, French *grand*, but Italian *pic-*

colo (or *piccino*), French *petit*, Spanish *pequeño*, *pequeñito*.

Here it is obviously *not* the *form* of the words which has caused the change; there was nothing in the Latin words for 'little' (*paruſ*), 'child' (*puer*, accusative *puerum*), boy (*adulēscens*) which should justify their elimination: they are not too short, they are not subject to any sort of confusion through homonymy: words of similar structure have not disappeared (cf. e.g., Italian *corvo*, Spanish *cuervo*, etc., from the Latin *coruſ*). It is obviously their *meaning* that provoked the crisis. Although in pure, dry logic 'big' is nothing but the opposite of 'little' (they are two opposite qualities of any object or being), in real life the two expressions are by no means directly comparable; while 'big' represents a rather prosaic, insignificant, objective, "neutral" quality, 'little' is charged with sentimental, affective, poetic and erotic values: it suggests grace, weakness; it arouses in our souls compassion, love, tenderness—feelings that are associated with women and children. The same is true, of course, for 'man' and 'child.' To call a woman twenty years old 'baby' is often a compliment; it is a ridiculous expression, if not an insult, when applied to a man of that age.

Language—we may therefore stress even now—does not follow dry, abstract, philosophical logic; it rather reflects the sentimental, artistic and emotive part of the soul. It can be interpreted through psychology, not through logic. It has its sources much more in the subconscious, irrational, childish and poetic section of our psyche, than in the logic, rational, conscious and philosophical one.

Sec. 5. *Popular Etymology*. Likewise, in the case of so-called popular etymology, the *meaning* reacts on the *form* or *phonic material* of the word. There is nothing wrong with the English word *asparagus*; it is a good word to indicate a certain eatable vegetable. But it is (as many other words, of course) a mere symbol, like a tag on the objects in a museum, or a number in a catalogue. It perfectly satisfies the need of a symbol for understanding between men; but the difficulty is that language is not only a means of communication of ideas and facts (as some linguists wrongly claim), it is (and even more so) an artistic means for the extrinication of man's feelings, imagination and poetical fantasy, of his need of *expression*.

The word *asparagus*, logically satisfactory, does not satisfy the speaker's imagination: it is replaced, in some dialects, by *sparrow-grass*, which is logically much less satisfactory, since it is inexact (*asparagus* is not a *grass*, and *sparrows* do not usually eat it) and moreover apt to cause confusion (someone might confuse *asparagus* with some other kind of plant which *sparrows* usually eat, or believe it to be a grass). Still, despite these linguists, popular etymology—a purely artistic and emotive phenomenon—is extremely frequent (as Gilliéron has shown) and much more so than is usually admitted in linguistic manuals. These so-called *popular etymologies*, he said, frequently despised by "orthodox" scholars as *false*, because they disturb the regularity of "phonetic change," are in effect real, much more real, in a way, than the etymologies of our dictionaries, since they act and change the *form* and frequently also the *meaning* of words, a thing which the scholarly etymologies of our etymological dictionaries never do.

Other examples in English are *east-worm* or *easter-worm* for *eas-worm* (root of *eat*, cf. Latin *ēscā* from *edō*; the worm is used as *bait*) in the Ling. Atlas of New England (map. No. 236); *goose-berry* from *groze-berry* (*groze* comes from a French word akin to the modern French *groseille*); *man-drake* from *mandragora*; *bridegroom* was in Old English *brydguma*, where *-guma* is 'man,' Latin *homō*, etc. (I take some examples from Bloomfield, *Language*, p. 423); inversely the English *country-dance* became *contredanse* in French (which is an absurd formation, Vendryes remarks!); and there is no more sense in *lait d'ānon* from Latin *laudanum*; likewise, Italian *pomi dei Mori* became in French *pommes d'amour* (whence English *love-apples*, German *Liebesapfel*) etc. (I take these examples from Vendryes, *Language*, p. 213.)

Sec. 6. *Is There a Connection between Sound and Meaning?* Obviously not, if we mean a *necessary* connection; nothing seems to be *necessary* in language, as is the case in any other human activity, such as art, literature, politics, etc. It is clear that if such a necessary connection existed, two consequences would inevitably result: first, language would never change; second, we would all speak the same language, since the same idea or feeling could be expressed only by one word, always the same. This is

evidently not the case. When the Englishman says *book* and the Italian says *libro*, or even better, when the Englishman says *one thousand* and the Italian says *mille*, they mean absolutely the same thing, without the shadow of a difference: still, although the meanings are identical, although the speakers have exactly the same idea in their minds, they express them by means of quite different words: the words *book* and *libro*, *thousand* and *mille* have absolutely nothing in common in form, and they never had, for they are of entirely different origin. They are two different tags attached to the same object, having no other function but to indicate the object in two different, yet quite equivalent ways. This is what linguists mean by the *arbitrary character of the linguistic sign*, that is, of the word (in its phonic aspect). It is as if by convention some men had agreed on some values of certain groups of sounds, and other men on other, quite different values. This is clearly shown, e.g., by the symbols called numerals: 100 is pronounced in different ways by all peoples in the world, yet when they pronounce the corresponding words, they intend to express exactly the same idea.

Sec. 7. *Onomatopoeia or Creation of Words by Imitation of Natural Sounds*. However, this idea of the arbitrary character of the sign, which is correct in general, cannot be accepted today with the same rigor as it was thirty years ago. Nothing is *absolute* or *rigorous* in language. There are at least two important reservations to make. The first one, known for a long time, is the so-called *onomatopoeia* or *direct imitation* of natural sounds by means of the phonic material of words: English *blab*, *splash*, *bubble*, *chink*, *clank*, *sizzle*, etc., are simple reproductions of the sounds produced by the objects or beings they represent, or the action of producing the sound. Certain words or actions where the sound is most characteristic are more frequently, or almost regularly, of onomatopoeic origin in all languages: so the bird *cuckoo*, German *Kuckuck*, Italian *cuculo*, Greek *κουκου*, Old Church Slavonic *kuhavica*, Sanskrit *koṭilās*, etc. (notice the absence of the sound-shift in Germanic, which points to a new creation in the Germanic languages); or English *whisper*, Danish *hviske*, Old Norse *hvisa*, German *flüstern*, French *chuchoter*, Italian *sussurrare*. We would be led to think that we approach here the process of the creation of language itself;

could not all words have originated this way? This seems to be, however, at least for the present, a very daring hypothesis, for the percentage of words of sure onomatopoeic origin in all languages is (and always was, as far as we know) very small; they are limited to a few concepts, usually the same everywhere. Moreover, they seem to remain apart from other words, preserving frequently against all phonologic changes their particular onomatopoeic character; they rarely enter, so to say, into the great stream of language.

We can probably include in this same class *nursery forms* or *infantile words*, such as *baby*, *daddy*, *mommy*, *mama*, French *bébé*, *papa*, *maman*, *pipi*, Italian *bambino*, *mamma*, *babbo*, *tata*, *pappa*, *tutù*, *pupù*, Latin, *atta*, Turkish *Ata*-(*türk*), etc. It is not surprising that they are found in similar forms all over the world.

Sec. 8. *Symbolic Value of Certain Sounds or Groups of Sounds*. The other reservation to be made to the general assertion of the *arbitrary character of the sign* is the fact, noticed only recently, that certain sounds are frequently (although never necessarily) associated with certain meanings, although no onomatopoeia whatever can be discovered. If we examine the Italian words for 'child' and 'little' on the maps of the Italian Linguistic Atlas, we will immediately notice that, although different from each other and not allowing any common etymology, they offer a certain resemblance: we frequently find groups like *pit-*, *pič-*, *pič-*, *čit-*, *čik-*, *nik-*, *čuk-*, *tsik-*: the vowel is *-i-* (less frequently *-u-*), usually enclosed between two stops (or an affricate and a stop). They resemble each other, but the variations enter into no "phonetic rule" whatever and are not comparable with those of the majority of the other words (they do not present such "normal" variations as Tuscan *pelo*, Sardinian *pilu* or the like). The same can be frequently noticed in other languages: Latin *pitinnus*, *putillus*, *pusinnus*, *pisinnus*, French *petit*, Spanish *niño*, *chico*, *pequeño* (from something like *pičhineus*). English *little*, *chick*, *kid*, *kitten*, *dinky*, *teeny-weeny*, *wee*, Romanian *mic*, Greek *μικρός*, etc. On the other hand, in the adjectives meaning 'big', 'fat', we frequently find the broad or deep vowels *a* or *o*: Latin *magnus* (preserved in Sardinian *mannu*), *grandis*, *crassus*, Italian *grande*, *gresso*, *grasso*, Spanish *grande*, *gordo*, French *grand*, *gras*, *gras*, German *groß*, Russian *bolšoj*, etc. The same is

frequently remarked in suffixes: Italian *-one*, *-otto* are augmentatives, but *-ino*, *-etto* (from *-itus*), *-uccio*, *-illu* (in dialects) are diminutives, as are Spanish *-ín* and *-ito* (which according to "phonetic rules" should be *-eto*).

This important problem has been investigated very little up to now; but if properly studied, it is apt to shed much light in the near future on many linguistic questions.

Sec. 9. *Poetical Harmony*. In this problem doubtless lies the secret of harmony in poetry. There is no doubt that in all great poetical creation there is a mysterious link between phonic form and meaning: this can easily be proved by substituting in any verse of Shakespeare, Shelley or Dante one word with a synonym of identical meaning, accent, and number of syllables, but of different phonic composition (vowels and consonants). Although it is difficult to say in every case why, we feel clearly that the beautiful verse of Dante:

non sonò sì terribilmente Orlando

expresses an epic, dramatic, warlike content (only consider whether these sounds could fit, e.g., a love-scene); likewise in the famous *terzina*

Quale ne' plenilunii sereni

Trivia ride tra le ninfe etterne

Che dipingon lo ciel per tutti i seni . . .

describing the purity and joy of a serene lunar night studded with stars, Dante has obviously sought a particular effect by the abundance of liquid consonants (*l*, *r*, *n*) and acute vowels (*i*, *u*, *e*; notice the almost total absence of *o*, the scarcity of *a*: 2 out of 33 full vowels). No person with a minimum of taste for poetry would hear a battle-cry or a funeral mourning in these verses, just as he would not hear an outburst of joy or a nuptial march in Verlaine's:

Les sanglots longs

Des violons

De l'automne

Blessent mon coeur

D'une langueur

Monotone.

Or:

Il pleure dans mon coeur

Comme il pleut sur la ville,

Quelle est cette langueur

Qui pénètre mon coeur?

It would be easy to multiply examples, and every person even slightly familiar with poetry will find many more.

Sec. 10. *Does Language Represent Society?* If language is a characteristic of the social activity of man, if linguistics is (as we said) a social science, it seems a natural conclusion that language must represent society, must reflect its ideas and feelings, and so on; the English language should therefore be the mirror of the English people, the Italian language, of the Italian people, and so on. This important question does not allow a simple and precise answer. Several considerations must be taken into account.

First of all, granted that language represents the culture of a people, it would be true that, e.g., English represents the culture of the English people, let us say in the twentieth century, only if the English had created *ex nihilo* their own language in this century. This is obviously not true; the English language of the twentieth century is nothing but the continuation and development, with a very few changes, of the English language of the nineteenth, and this in turn is the continuation of the language of the eighteenth, and so forth back to Germanic and Old French, etc. Therefore, modern English, if it does reflect any culture, must reflect not only and specifically the culture of the generation that is speaking it, but also the culture of all the generations that spoke it in the past, and whose respective cultures differed widely from that of our own time. In other words, language is a historical product, the result of an infinite series of historical changes, an organic accumulation of fossils of all times; it is a sort of a museum of antiquities of all ages, where many, even most things, seem to us, if we consider them linguistically, anachronistic and absurd in our time, just as the weapons and instruments we see in a museum. The English language is not more up-to-date than the English spelling; it is even much less so. There is no logical reason for plurals like *goose: geese*, or *mouse: mice* (cf. *house: houses*); and there is no logical reason in modern French for the feminine gender of *la lune* 'the moon' and the masculine gender of *le soleil* 'the sun'; this opposition had a meaning thousands of years ago, but it has none today: still it is deeply rooted in the French language (although it has almost disappeared from English) and, absurd as it is,

shows no sign of weakening. Tradition, an extremely strong factor in all social phenomena, is perhaps even stronger in language than elsewhere. It is the fundamental force in language.

Modern English or modern American are no more a creation of modern English and modern American culture than the classical Roman architecture of Pennsylvania Station in New York; that is, only to a very limited extent, since obviously another architectural style could have been chosen for the construction of that building.

In the first years of his life, the American or the Italian child learns his language from his elders, that is, he *imitates* it, and he does the best he can. All his efforts tend not towards differentiation, but towards assimilation; in other words, he does not choose his language; his language is imposed upon him, and during all his life society will vigilantly observe him and eliminate either by satire or by even direct compulsion (examinations in school, hindrances in his career, social boycott, etc.) the errors in his speech, that is, the infidelity to the traditional ancestral pattern of language. Under these conditions, it is not surprising that language changes so little. It is surprising that it changes at all.

Therefore, the possibility that the English language in the twentieth century may reflect the English culture of the same period has to suffer one limitation: that only the changes introduced during the twentieth century into the English of the nineteenth century can be considered as significant. However, other facts have to be taken into account.

Sec. 11. *The Three Aspects of Language.* English must not only be considered as a national institution; it is also a language in the universal sense of the word. All men speak, expressing thereby their feelings and thoughts, exactly as the English do, although by different means. In fact, every English speaker, as well as every Italian or every German speaker, has to be considered under three aspects. A man in general as opposed to animals is first of all a member of the human race; an Englishman has therefore many features, both biological and psychological, in common with the Japanese and the Zulus. He is in the second place an Englishman; that is, a member of the English community, in which he has lived and from which he has absorbed ideas, customs, behavior,

religion, poetry and so on. He is in the third place an individual man, with individual characteristics of his own, which make him a unique phenomenon and which distinguish him sharply from every other man, no matter how much he may have in common. The same is obviously true for language. We have, therefore, to distinguish three aspects of language (already indicated abstractly by De Saussure with the names *langage, langue, parole*):

a. *Language as a universal phenomenon.* It is a known fact that distant languages, apparently not related to each other, present similar grammatical or semantic phenomena. This is so true that many illustrious scholars consider it possible to discover some general rules and tendencies common to all languages of the world. This is what the great French scholar Meillet called *general linguistics* (*linguistique générale*). Following Meillet, and generally the French way of thinking in universal categories, the French school has concentrated on this aspect of linguistics, followed especially by the Danes. This will be examined in the following pages (Secs. 12 ff.).

b. *Language as a national phenomenon.* Language, with all limitations as stated above, doubtless reflects to a certain extent the culture and psyche (way of thinking and acting) of a certain people: the French language contains the accumulated historical experience of the French people, the German, of the German people, and so on. Although some exaggerations and technical mistakes have been committed in this study, there is no doubt that the tendency to study this aspect of language is not only permissible, but sound, and deserves every encouragement. Again it is probably not by chance that Germany, the country where Romanticism and the nationalistic movement was born, has also been the cradle of this method of investigation: Vossler, Spitzer, Lerch are among its most illustrious representatives. The whole movement began, however, with the Italian philosopher B. Croce. (See on this subject the following paragraphs.)

c. *Language as an individual phenomenon.* But language is also something which pertains to the individual man: no man speaks or writes exactly as the other one does. In his pronunciation, in the pitch of his voice, in his choice of words and sentences, in a word, in his *style* he differs from every other speaker and at the

same time reveals some physiological or psychological characteristics of his own, just as he does in his every act, even the most insignificant. If we know someone even to a very limited degree, we can recognize without difficulty a text written by that person. We may have difficulty sometimes in saying why we attribute such a letter, saying, or expression to Charles, Dick or James, but the fact remains that we do recognize his way of speaking or writing as surely as we recognize his face and sometimes even more. This is even more true in the case of an artist, whose style is of course more characteristic, more personal, precisely because art is nothing else but the strong expression of a strongly individualistic and independent personality. Nobody will confuse a page of Bernard Shaw and of Oscar Wilde, although they are contemporaries and write a perfectly correct English. This aspect of linguistics has been until recently almost entirely neglected, a fact which is deplorable, because, after all, all linguistic innovations are of individual origin, and the only concrete and real fact that we can study in linguistics is the *individual speaker*. We do not speak in chorus, and a concept such as *the English language* is already to a certain extent an abstraction, viz., a generalization drawn from the common features of all English speakers, disregarding the inevitable individual aberrations of each speaker from the abstract norm: that is, the individual, artistic, and imaginative element of each speaker—the gist itself of life.

It is not at all surprising that in Italy, that land of art, of Humanism, of the Renaissance, of Vico's philosophy, which asserted the personality of the individual thinker and creator against any superior force, the land where, as it has been said, "the plant that is man grows stronger than anywhere else," the study of this important aspect of language should have originated. The great Italian scholar Bertoni, a follower of Croce's idealistic philosophy, and some of his disciples, have written some essays on the language of several authors which should be models for a series of further studies in other countries.

Sec. 12. *Language as a Universal Phenomenon*. The attempts to write what is called a general semantic grammar for all languages (that is, the elaboration of general semantic categories) on which several distinguished

French, Czech, Russian, and Danish scholars have worked in recent years with very interesting results, have not yet reached a stage suitable for presentation in a relatively popular article as this wants to be. But there is another point on which many well-known linguists agree (I will mention here among the recent ones the names of Wackernagel, Meillet, Vendryes, Cuny, Lévy-Bruhl, Jespersen, Sommerfelt, R. Jakobson, Brøndal, Sapir, Sturtevant): all the languages of the world seem to show certain trends, to follow the line of a certain evolution; they all seem to pass through certain stages of development, just as humanity passes or passed through the stone-age, the bronze-age, the iron-age, etc., and showed some other common trends toward modern civilization. And just as in the case of human anthropology some tribes are even today culturally and psychologically on the level of the stone-age or the bronze-age, which we left behind us thousands of years ago, so in the case of language some living primitive tribes have preserved a more or less primitive type of language, which does not show the changes which other languages of more cultured people now show, or once showed, and have left behind them for a long time. In other words, the trend (as far as we can see in the languages whose history we know) is $A > B > C > D$; but some languages have remained in A or B, and show no trace of further developments. By no means do they constitute therefore an argument against what we may call the evolutionistic theory.

Sec. 13. *Examples of General Linguistic Trends*. Some examples of such *general linguistic trends* are the following:

- (1) Loss of the dual number in verbs, nouns, pronouns (in this order).
- (2) Creation of the definite article (usually built out of a demonstrative pronoun) and of the indefinite article (out of the numeral 'one').
- (3) Loss or weakening of the verbal aspect (as exemplified by the Slavic languages) and introduction of tenses as the basis of the verbal system.
- (4) The creation of a passive in the verb.
- (5) The elimination of gender.
- (6) The elimination of the nominal and verbal flexion.
- (7) The elimination (through analogy) of irregular forms, especially of what is

called very improperly suppletion (the type *ferō tulī, uīs rōboris*, etc.).

- (8) The transition from a synthetic to an analytic type of grammar (*dicō > I say, lupis > to the wolves, uīdī > I have seen, uīderem > I would see*, etc.).
- (9) The trend from certain sounds or systems of sounds to others.
- (10) The progressive shortening of words, especially through the loss of the endings, eventually resulting in a monosyllabic structure.
- (11) The increase of abstraction in the lexicological material.

These phenomena (and several others which could easily be pointed out) are produced so slowly, in such a roundabout, hesitant, and often contradictory manner, that their action can frequently be recognized only when we compare two stages of the same language hundreds or even thousands of years apart; and this of course is possible only in very few cases (Greek, Latin, Iranian, Sanskrit, Chinese, and some Semitic and Hamitic languages).

Of course, discussion and doubts may arise on some of the phenomena mentioned above; however, so many and such authoritative linguists agree on the general principle of the trend (and this is what really matters here) that the question deserves to be examined by psychologists, for whom it is of the utmost importance.

Sec. 14. *Psychological Explanation of the General Linguistic Trends.* To observe facts is one thing; to explain them, another. While many linguists (perhaps a great majority) admit the general trends indicated in the preceding section, some of them may not agree on the explanation, and will merely limit themselves to observe things, without any attempt to an interpretation. This is, however, not difficult to find, and has been already proposed by several of the scholars mentioned above. It follows essentially the lines anticipated by the great philosopher of history, Giambattista Vico, whose work, almost entirely neglected until recent years, contains in germ the elements for the solution of most great problems concerning man—art, literature, philosophy, law, customs, etc. The explanation is, in short, this: During the evolution of humanity from primitive forms of life to modern civilization, the way of thinking of man—that is, his mental categories—has

changed not less than his material way of living—nay, we can say that his material way of living has changed precisely because his way of thinking has (without denying, by this, that to a certain extent his material way of living has reacted upon his mind, modifying and especially accelerating his mental evolution). Concepts, thoughts, reasoning which are familiar and even obvious and trite to us, the heirs of thousands of years of more or less logical thinking, were not so to our ancestors of the palaeolithic age, nor to contemporary savage tribes. The primitive man lives in a mystic, magic, emotive, irrational atmosphere, full of religious interdictions, fears, and superstitions. This whole conception of life, of causality, of things is highly subjective and entirely different from our own. Just as for the child, for him nature is alive, populated by strange and evil monsters, by thousands of different gods, nymphs, spirits, goblins, which have to be honored, feared, and placated, which constantly threaten his life and security if not properly treated with the elaborated ceremonial of magic rites. A stone is a stone for us, a dead object, a thing, a compound of certain chemical substances; it is a force, a daemon to the primitive, it is endowed with terrible, mysterious powers (and this belief, e.g., subsisted in part throughout the Middle Ages). The trend of civilization is on the contrary towards an objective, factual, rational, logic mentality. This does not mean at all that we are always perfectly logical, that we reason well; but even when we fail to do so (and we frequently do) at least we try or pretend to reason according to certain logical standards, which the primitive man did not possess, or at least possessed in a much smaller degree.

It is of course obvious (and really need not be said) that this opposition is not absolute, as no human fact is; and that some rational element will always be found among savage tribes, even among the most primitive, while on the other hand we know only too well that elements of primitive thinking survive everywhere in civilized societies, and that they still lie deep in the soul of every man.

The child's mentality will help us in many cases to understand the primitive man, since it is very likely that, just as the foetus goes through the whole evolution of the species, the mind of the child goes in a few years through

all the long and painful paths of the mental development of mankind (and perhaps not only of mankind) through the ages.

Sec. 15. *Aspect and Time in the Verbal System.* In most languages of the world verbs have no *tenses*, but only *aspects*. This corresponds to the mentality of the primitive man, interested very much in movement, in the way the action is produced, and in its result; that is, in the aspect (unique, iterative, perfective, imperfective, punctual, linear, durative, intensive, terminative, ingressive, etc.). It is a well-known fact that savages have much finer and more delicate senses than we have, that they can perceive thousands of sounds, smells, colors, objects which escape us entirely. They are nearer to nature and their life is concentrated on exterior objects and sensations, on which their difficult daily life is based. The same is true, of course, for our ancestors of Europe. Solomon Reinach writes the following remarks on the palaeolithic art of the reindeer hunters:

"Finally—and this is perhaps the most extraordinary detail of all—the artist of the reindeer age is in love with life and movement; he likes to represent his animals in lively and picturesque attitudes; he seizes and reproduces their movements with extraordinary precision. . . .

The masterpiece of this phase of art is perhaps the group of stags engraved on an antler discovered in the cave of Lorthet (Hautes Pyrénées). First we see the hind feet of a stag which is galloping away. Next comes another galloping stag, in an attitude first revealed to us in modern times by instantaneous photography as applied to the analysis of rapid movement. An artist of our own day, Aimé Morot, first made use of the knowledge gleaned from photographs, and reproduced this action in his horses. It was unknown to all artists of intermediate ages."¹

Time, on the contrary, a very abstract category, is almost absent in the mind of the primitive. He cannot read or write, nor use calendars; he does not know his own age or that of his wife or children, nor does he care to know. All his interests are in the present, with all its problems so complex to him. The past he forgets quickly, the future he cares little about. Time-determinations—even outside of the ver-

bal system—are rare or absent in primitive languages. It is also a well-known fact that the *time-adverbs and prepositions* in all languages—so far as an etymology can be found—were originally *spatial expressions*: space is psychologically a much more concrete mental category than time, since several objects appear in space contemporaneously and can be perceived by our senses and compared. This is not true of time.

The most difficult tense to produce is, of course, the future. Few languages have a true future tense, although many will somehow express a future event with the help of adverbs such as *tomorrow*, *next month*, etc. Future is the last tense to appear and only after a long and difficult struggle. Usually languages help out by means of periphrases with verbs like *I will* or *I shall* or *I can*, a proof that what was originally meant was a *wish* or a *duty*, or a physical or mental *capacity*, not a real, *prospective* future. To foresee, prepare, anyhow consider objectively—without sentimental interferences—future events is in effect one of the most difficult tasks of human mind, much more so than to remember the past (a fact which clearly reflects in grammar.) It is practically impossible to reconstruct an Indo-European future; Slavic languages have even today no clear formation for the future; Gothic had no future; modern German makes no great use of its heavy construction with *werden* (a relatively recent innovation); even English, otherwise a very modern language, has not yet developed a true, unequivocal future, like French *je ferai* or Italian *farò*, as proved by the famous joke of the drowning Irishman who cries: "I will drown and nobody shall save me"—a joke which would be impossible in Italian. It is also probable that the loss of the Latin future in the Romance languages (which later reconstructed a new future with *habere*, originally of the *shall* type) is due to the ruin of a philosophical, intellectual civilization as the Greco-Roman was and its replacement with an emotional, fantastic, mystic type of culture, but of a definitely lower intellectual standard. Vossler's remarks on the future in general are anyhow excellent (*The Spirit of Language in Civilization*, New York, 1932, p. 61): "But [in vulgar Latin] the whole temporal conception of the future was weak and it broke down. There is hardly a language in which it is regularly used by the

¹ *Apollo*, English translation, New York and London, 1924, pp. 5 f.

common people. The concept of the future, like the prophet in his own land [?], is usually neglected, or in some way misused and obscured by colloquial speech. For the ordinary man, attitude towards things is always that of willing, wishing, hoping, and fearing, rather than that of imagination [?], thought or knowledge. Probably the surest measure of the extent and depth of our education is the degree of calm and self-possession that we preserve in view of the future. Continuous collectedness and self-possession—in short, a philosophical temperament and attitude of mind—are needed if the temporal outlook on the future is not to deviate into the modal spheres of fear and hope, of the wish, and of the uncertainty."

That children have likewise very vague conceptions of time, and are not interested in the matter, is also a well-known observation.

Sec. 16. *The Origin of Gender*. It would be easy to show how, in the same way, several other of the general trends mentioned above (such as the loss of inflection, the creation of the article, the loss of the dual) can be explained; but such a demonstration would surpass the limits allotted to this subject by this encyclopedia. I will treat here only the disappearance of gender, because of its special interest from the point of view of psychology. It is a well-known fact that in modern languages gender is in most cases an absurdity from the contemporary point of view. There is no reason why, in modern French, 'the nose' (*le nez*), 'the field' (*le champ*), and 'the sun' (*le soleil*) should be masculine, but 'the table' (*la table*), 'the mouth' (*la bouche*) and 'the moon' (*la lune*) should be feminine. In other cases—when human beings or animals are concerned—the thing seems, within certain limits, justified. Here genders correspond (although by no means perfectly) to the sexual opposition of male and female. 'The boy' and 'the bull' are masculine (*le garçon*, *le taureau*), but 'the girl' and 'the cow' are feminine (*la jeune fille*, *la vache*), although even in this domain some incongruities might be found (Italian *la guida* is generally a man; *la lepre* 'the hare,' *la tigre* 'the tiger' are always feminine, but *il gatto* 'the cat,' *il leone* 'the lion' are always masculine unless specification is needed). There is no explanation from the point of view of Italian and French; these "absurdities" go back to Latin, where *campus*, *nāsus*, *sōl* were mascu-

lines, but *bucca*, *lūna*, *tabula* were feminine; and Latin itself offers no clear explanation. We have to go further back. The right solution of this strange phenomenon was already guessed by Humboldt and Herder, and then developed by Adelung, Grimm (*Deutsche Gr.*, 3, 345 ff.), Pott and recently by Jacob Wackernagel and by the great French scholar Antoine Meillet. This explanation lies deep in the mentality of our Indo-European ancestors. *Gender* was due originally to the *personification* (or *divinisation*, which is a sort of personification) of inanimate objects (stone, water) or phenomena (fire, thunder, rain, day, etc.) in the mind of the primitive man. Just as the child hits in revenge the table or the wall that hurt him while he was playing, so does the primitive man attribute soul and life and will to objects or plants: Greek and Roman mythology still abounds with nymphs and gods of springs, mountains, rivers, trees, etc., which are nothing but personifications; long stories are told about their exploits and loves, which constitute one of the main themes of classical poetry. The *sun* and the *moon* were gods, therefore living beings endowed with *sex*, and so were *heaven* and *earth*, frequently united in mystic marriage (as e.g. in Hesiod). That is why they are of opposite sexes. It will be noticed that although their sexes may interchange, the opposition remains: if 'the moon' is masculine (German *der Mond*, Lithuanian *mėnėsis* or *mėnuo*), then 'the sun' is feminine (German *die Sonne*, Lithuanian *saulė*); but when 'the moon' is feminine (Latin *lūna*, Greek *σελήνη* or *μήνη*), then 'the sun' is masculine (Latin *sōl*, Greek *ἥλιος*). In Lithuanian and Latvian folk-songs, 'the moon' (masculine) is the husband of 'the sun' (feminine). Latin *aqua* (feminine) and *ignis* (masculine) are likewise a close couple (cf., e.g., the age-old formula *aquā et igni interdīcere*). Slav has also *ogni* (masculine) and *voda* (feminine); but in Lithuanian, where *ugnīs* is feminine *vanduo* is masculine! Now the worship of springs and rivers (of moving waters) is well known in antiquity. The waters and the fire (another moving element) are important divinities in the Avesta and in the Vedas. *Agnis* (the same word as *ignis*) is the most important god. It can be seen clearly that, when we do not find in one language (German, French or Latin) the answer to our question, we usually find it in an older stage, through comparison and re-

construction, provided we try to understand the mentality of people who were different from what we are now.

'The day' and 'the night,' so easy to oppose to each other, also make a couple: Latin *diēs* is masculine (cf. the god *Diēs-piter, Iuppiter*, Greek *Ζεύς πατήρ*, Sanskrit *Dyaús pitṛ*), but *nox* is feminine (German *der Tag, die Nacht*; Russian *djen*, masculine, *noc*, feminine).

It will be noticed that frequently the gender remains, although the name itself changes. The Latin *lūna* is a different stem from the Greek *σελήνη* or *μήνη*, but they are all feminine; German *der Tag* is a different word from the Latin *diēs* or Russian *djen*, but they are all masculine, and so German *Himmel*, Greek *οὐρανός* as opposed to *Erde*, Greek *γῆ, γαῖα*. The personification and consequent sexualization is so strong that it survives even the loss of the word. Another excellent example is the word for 'hand,' which is feminine in most Indo-European languages, although represented by quite different stems: Latin *manus*, Greek *χείρ*, German *die Hand*, Lithuanian *ranká*, Russian *рукá*, etc. Sometimes the masculine is found, as in the Tocharian A *tsar*, Avestan *gav-* (the daëvic word), *zasta-* (the ahuric word), Sanskrit *hástas-*; but never the neuter. Likewise, the 'finger' is almost always masculine, although its stem changes everywhere. 'Hand,' 'finger,' 'foot,' 'tooth,' 'tongue' are moving, living parts of the body which cannot be conceived as objects. Cf. on the other hand, Latin *oss* 'bone,' Greek *ὀστέον*, Sanskrit *ásthi*; Latin *genū* 'knee,' Greek *γόνυ*, German *das Knie*, Sanskrit *janu*; Latin *iccur* 'liver,' Greek *ἥπαρ*, etc.; and also *das Herz, das Bein*, Latin *crūs n., cor n., corpus n.*, Greek *τὸ πῆρ, τὸ σῶμα, τὸ στόμα*; 'head,' 'mouth,' 'eye,' 'ear' vary. Nor is it difficult to understand, in my opinion, why 'the tooth' (a strong, hard, fighting, penetrating element) should be masculine, 'the tongue,' weak and soft, generally feminine: Latin *lingua*, German *die Zunge*, Greek *γλῶσσα*, Avestan *hizvā*, Sanskrit *jihva*; masculine in Avestan *hizū*, Russian *jazúk*, Lithuanian *liezvis*; the neuter is never found.

'The wind,' 'the storm,' 'the thunder' are never conceived as objects, as inanimate things. They are never neutral; they are powerful, active, dangerous forces: 'the wind' is masculine (Latin *uentus*, German *der Wind*, Greek *ἄνεμος*, Russian *vjétjer*, etc., and so 'thunder'

in Latin (*tonitruus*), German (*der Donner*), Russian (*гром*); while 'the storm,' perhaps conceived as a larger, enveloping force, is frequently feminine: Latin *tempestūs, procella*, Greek *ἄελλα*, etc. *Wind* and *thunder* are gods, or are represented by gods, in the mythology of several Indo-European nations. The Latin *salūs* (feminine) corresponds etymologically to the Avestan goddess *Haurvatāt*.

Meillet has likewise discovered that 'sleep' and 'dream' are active, living forces which impose themselves upon man: Latin *somnus*, Greek *ὕπνος*, Russian *сон*, German *der Schlaf*; Greek *δνειρος*; German *der Traum*, etc. Death, the old man with the sickle, who "carries us away," is feminine (Latin *mors*, Russian *smjert*, etc.) or masculine (Greek *θάνατος*, German *der Tod*), never neuter.

Abstract nouns were also conceived as divine powers, dominating, impelling, and attracting man; they are very seldom neuters: Latin *amor, terror, metus, libidō, cupidō* (also a god!), German *die Liebe, die Furcht, der Wunsch*, Greek *ὁ φόβος, ὁ Δεῖμος* (both personified in Homer). They are generally feminine, as the Greek nouns in *-σις* (*δόσις*, etc.), *-της*, the Latin in *-tūs, -tās, -tūdō, -tiō*, the German in *-ung, -heit, -schaft, -nis*, the Russian in *-otá*, etc. We see here a step of the primitive mind in its painful striving toward the formation of abstracts.

Sexual imagination surely played an important part in the personification, which means essentially sexualization of objects and events. We have seen, above, the examples of 'tooth' and 'tongue.' The *hand* (and so the *palm*), Meillet remarks, is usually feminine, because it receives; the *foot* is usually masculine for opposite reasons. It is slender and long and enters into the road, which is frequently feminine (Latin *uia*, Greek *ἡ ὁδός, ἡ ἀγορὰς*, French *la rue*, Italian *la strada*, German *die Strasse*). The finger is almost always masculine. In Latin the names of trees (beginning with the tree itself, *arbor*) are feminine because they are productive creatures, whereas their products, the fruits, are objects and therefore neuters: *mālus, pirus*, feminine; *pirum, mālum*, neuter. Here, as usual, Latin preserves very old Indo-European habits. The tree was a living creature for primitive Indo-Europeans. It is called in Sanskrit *pāda-pas*—"the one who drinks through his or the foot"—and 'the root' is in Sanskrit *mūlam* (neuter),

which is obviously the same word as the German *das Maul*, 'the muzzle.'

The comparison, or, rather, the identification of the tree with the human being has remained deep in our souls for thousands of years. Horace has *reducunt iam gramina campis arboribusque comae*; Virgil incorporates Polydorus into a myrtle tree; and Dante in his *Canto of the Suicides*, Aristo in the description of Alcina's island gave to his fancy even more wonderful developments; and even in the twentieth century, a man educated in the most modern nation of the world, Joyce Kilmer (1886-1918), wrote the beautiful little poem that every American schoolboy still enjoys:

I think that I shall never see
A poem lovely as a tree.
A tree whose hungry mouth is prest
Against the earth's sweet flowing breast;
A tree that looks at God all day
And lifts her leafy arms to pray;
A tree that may in summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

The tree's *hungry mouth* in Kilmer's poem is, in my opinion, the one decisive argument in favor of the etymology of German *Maul*.

Gender distinction becomes almost useless in a civilized society, where this primitive way of thinking slowly disappears and is only preserved to a limited extent in poetry and in rhetorical speeches; it is no wonder that several modern Indo-European languages are dropping it or have already dropped it (Armenian, English, Danish, etc.); it is in most cases, as we have pointed out before, a useless fossil. Even in the cases where it corresponds to the reality of sex (*le garçon, la femme*) it can frequently be dispensed with without inconvenience. Everybody knows that a boy is a male and a girl a female, without any gender distinction. English and Armenian are not less clear, from this point of view, than Greek or French. In the few cases where a distinction would be welcome, it is easily supplied by other means: *a tom-cat, a lady-guest, a male goat, a girl-friend, a she-devil, a man-servant, etc.*

However, genders have not entirely disappeared in modern English. They remain in the

pronouns (*he, she, it; who, what*) and show thereby that they are latent in the nouns, too. (*There was a girl: she was sleeping; there was a boy: he was sleeping; there was a house: it was open.*) But what is even more interesting, gender, although reduced today to the extent that it is, still retains in two important categories its primitive personifying quality: nations and ships are feminine; that is, they are referred to with feminine pronouns: *England is a great nation: she will never die; the Japanese battleship Yamato was sunk yesterday: she was the pride of the Japanese Navy*. The personification is quite clear. Nations are usually conceived as female creatures (in paintings, monuments, etc.), and so are ships, which were and still are animated beings, christened at their birth, possessing a definite individuality, of which the captain and the sailors speak with affection, pride, and love, with which they live and often die. Until recently they were also given names of women (*Mary, Elizabeth, etc.*) and frequently had feminine figures on their prows. "The Liner she's a lady, an' she never looks or 'ceeds," wrote Kipling.

Sexualization, that is, personification, does not always go as far as divinization. There are, as we have seen, many intermediary degrees. Sometimes it reaches only a stage which we with modern feelings would call little more than a comparison. In Indo-European and in the Romance languages even yet, as well as in Semitic, the feminine represents frequently, with respect to the masculine, either a collective idea, or something larger, or simply a plural. The famous German scholar Johannes Schmidt has proved beyond any possible doubt in his book *Die Pluralbildungen der indogermanischen Neutra* (Weimar, 1889) that the Indo-European neuter plural in *-a* (*opus, opera; epulum, epula; mendum, menda; iugum, iuga*) is nothing but an old feminine collective. We still have *epula, opera, menda, rāpa, arua, labia, lāmenta, etc.*, and, even if some words are new, the type is surely very old. This is obviously the reason why the Greek neuter plural takes a singular verb and why Latin so frequently uses *ōra, guttura, colla, etc.*, with the singular meanings. We understand perfectly how some nouns already in Indo-European had two plurals, one "individualizing" (Latin *loci, ioci*, Greek *ὅρα, ἰσορά*, Russian *вѣстои, iocia*), one collective (Latin *loca, ioca*, Greek *ὄρα, ἰσορά*, Russian *вѣстои*,

etc.). In Italian and Romanian this type has persisted and even evolved further (*il frutto*, plural *i frutti* and collective *le frutta*; *l'osso*, plural *gli ossi* and collective *le ossa*; *il muro*, plural *i muri* and collective *le mura* [della città]; *il sacco*, *i sacchi*, *le sacca*, etc.). And a characteristic fact which proves that there is very definitely a sexual conception attached to this collective in *-a* is that it has reverted to a feminine: *il muro* like *il lupo*, but *le belle mura* like *le belle donne* (with the feminine adjective and pronoun). Moreover, we frequently find in the Romance languages a feminine in *-a*, indicating an object larger, or more comprehensive, or more open than the corresponding masculine in *-o*: Italian *la gamba*, *il gambo*; *la sacca*, *il sacco*; *la secchia*, *il secchio*; *la buca*, *il buco*; *la pozza*, *il pozzo*; *la spilla*, *lo spillo*; *la famiglia*, *il famigliaio*; *la cosa*, *il coso*; *la capanna*, *il capanno*, etc. Spanish *la huerta*, *el huerto*; *la saya*, *el sayo*; *la bicha*, *el bicho*; *la campá*, *el campo*; *la cepa*, *el cepa*; *la ceja*, *el cejo*; *la bolsa*, *el bolso*; *la coldera*, *el coldero*, etc., etc. Leo Spitzer, in *Revista de Filología Hispánica*, 3, 1941, pp. 362 ff., asserts that the feminine is bigger than the masculine because it "embraces" and "envelops" it, because the masculine "penetrates" into it; and no unprejudiced scholar, after studying the material presented in his article, can deny that on the main point Spitzer is right.

Sometimes, of course, the (real or supposed) character of an animal can decide the sex, that is, the gender of the noun: the strong, rapacious and cruel *wolf* is always masculine in the Indo-European languages (cf. the metaphoric meaning of the word in American slang!), whereas the weak, sly and cautious *fox* is frequently feminine. The *lion* is always masculine, the *butterfly* often feminine.

Of course, in the case of gender, as in language in general, the form has sometimes reacted on the meaning. Without going as far as Brugmann goes, we can very well admit that Old High German *namo*, *samo*, which were originally neuter (cf. Greek ὄνομα, Latin *nōmen*, *sēmen*, Sanskrit *nama*, Russian *imja*, *sĭmja*, etc.), became masculines because of their ending, which recalled masculines like *scīmo*, Gothic *skēima*, and that Greek τὸ κάρα became ἡ κάρα, τῆς κάρας by analogy of the feminines in -ῆ like οὐκοῦδ, δοκοῦδ. It is also very likely because of their ending that Latin *populus*,

laurus, *ficus*, *cupressus*, and the other tree names became masculine in Italian (*il pioppo*, *l'alloro*, *il fico*, *il cipresso*, etc.). Here the weakening of the ancient sexual conception of the tree as a productive female perhaps made way for the change; but this fact alone obviously could never have changed the gender of these nouns.

Personification of inanimate things or phenomena doubtless played and still plays a very important role in language. Here is another example. Indo-European certainly possessed, and most Indo-European languages still possess, an abundant class of so-called "imperative" compounds, where the first element is a verb in the second singular imperative, and the second usually a noun (indicating the object of the verb): cf., e.g., Μενέ-λαος, 'Αγέ-λαος, ἀρχέ-κακος, ἐχέ-φρων, ἐχε-νῆς, ἀρχέ-γονος, ἀρχέ-τυπος, Φερέ-νικος, φερέ-καρπος, δακέ-θυμος, φερέ-οικς, ταλα-πενθής, Τλη-πόλεμος, τλή-θυμος, ἐλελί-χθων, Sanskrit *Trasā-dasyus*, *radā-vasus*, *jahi-stambhas*, *ussahi-sodas*, *sthā-rasmā*, *śtaddhā-devas*, Avestan *xš'aya-ars'an-*, *fraspā-yaoxdra*, *nisā-snaiois'*, *frazā-baodanh-*, Latin *exerci-pēs*, *Cēdō-ateram*, Old Church Slavonic *Daždī-bogŭ*, *Stri-bogŭ*, Czech *Vladi-voj*, Spanish *lava-platos*, *perdonavidas*, *rasca-cielos*, *caga-tinta*, *caga-aceite*, *cagarrapa*, *mata-moros*, *saca-corchos*, *salta-montes*, Russian *Vladi-mir*, *Vladi-vostok*, Italian *reggi-petto*, *rompi-tasche*, *Bevi-lacqua*, *rompi-scàtole*, *rompi-collo*, *Vinci-guerra*, *Scaccia-pensieri*, *batticuore*, *casca-morto*, *attacca-panni*, *attacca-bottoni*, *cava-tappi*, *guarda-roba*, *ammazza-sette*, *grattacielo*, *sali-scendi*, *tergi-cristallo*, *non-ti-scordardi-me*, *gratta-schiena*, *porta-lèttre*, *porta-pacchi*, *lava-piatti*, *porta-sigarette*, *porta-cènere*, *spaventapàsseri*, *rompi-capo*, *gratta-capo*, *Frangi-pane*, *frangi-flutti*, *Schia-lacqua*, *porta-bandiera*, *para-fango*, *rendi-conto*, *crepa-cuore*, *schiaaccia-noci*, *accendi-sigari*, French *Boileau*, *Boi-levin*, *casse-tête*, *passe-partout*, *casse-cou*, *brise-lame*, *pissenlit*, *passe-temps*, *coupe-gorge*, *garde-manger*, *essuie-mains*, *jai-néant*, *porte-maneau*, *gratte-ciel*, German *Tauge-nichts*, *Habe-nichts*, *Sprich-wort*, *Stell-dich-ein*, *Vergiss-mein-nicht*, *Thu-dich-um*, *Habe-recht*, *Schreck-den-gast*, *Schreck-den-feind*, *Rühr-mich-nicht-an*, *Trau-gott*, English *break-fast*, *break-water*, *break-neck*, *break-vows*, *cut-paper*, *cut-purse*, *cut-throat*, *cut-water*, *dare-devil*, *pick-pocket*, *Do-little*, *Drink-water*, *Shake-lady*, *Shake-lance*, *Shake-speare*, etc. Some scholars (e.g., Osthoff and Jacobi) have asserted, it is true, that the first element of these com-

pounds is not an imperative, but a "pure verbal stem." This is, however, flatly contradicted by such forms as the Greek Ἀρχέ-κακος, χαρ-κακία, Χαρέ-στρατος, Χαρέ-δημος, Φανέ-λας, φερέ-οικος (we would expect -o- at the end of the first element of an Indo-European compound), Sanskrit *jahi-stambhas*, *ujjahi-joda-s*, Slav *Stri-bogŭ*, *Daždŭ-bogŭ*, Italian *non-ti-scordar-di-me*, *accendi-sigari*, *rompi-collo*, *reggi-petto*, *sali-scendi*, *batti-panni*, *Bevi-lacqua*, *rendi-conto* (the "pure stem" would be *accende-*, *rende-*, etc.), Spanish *haz-me-rretr*, *ten-t-em-pié*, *ten-t-en-el-aire*, *ten-te-mozo*, French *rendez-vous*, *chassez-croisez*, German *Vergiss-mein-nicht*, *Thu-dich-um*, etc., are forms which evidently have an imperative as the first element.

Now, as can easily be seen, many of these forms do not indicate *persons*, but *objects*, *concepts* or *feelings*; they are obviously personifications, and are addressed with a sort of vocative: *break (the) water!* *break (the) fast!* Cf., e.g., Greek δακέ-θυμιος (ἄτη), φερέ-πονος (ἀμπλακία), φερέ-γγυος (λιμήν), ἔχε-πενκές (βέλος), Russian *Vladi-vostók*, Italian *reggi-petto*, *attacca-panni*, *taglia-carte*, *accendi-sigaro*, *porta-sigarette*, *rompi-capo*, *gratta-capo*, *crepa-cuore*, *schiaaccia-noci*, French *casse-tête*, *cure-dents*, *brise-lame*, *coupe-papier*, *essuie-mains*, *passe-temps*, English *break-fast*, *cut-paper*, *break-water*, etc.

It is also very likely that—as some scholars claim—a *divine force*, an *agent*, is hidden in the pronoun of the so-called "impersonal" verbs, such as: English *it rains*, *it snows*, French *il pleut*, *il neige*, German *es regnet*, *es schneit*, *es giesst*, *es schüttet*, etc. Cf., e.g., Latin *Iūpiter fulgurat*, *Iūpiter tonāns*, *loue fulgente*, Greek Ζεὺς θε, ἀστράπτει, ἐβρόντησε, ὕσον ὄφιλε Ζεὺ ὁ θεός ἔσεισεν, etc. These verbs even take an object in the accusative: Greek *θεὶ χροσόβν*, Latin *pluit sanguinem*, German *es regnet Steine*. The Western Romance languages use even, for similar sentences, the typical verb of action, *facere*: Italian *fa freddo*, *fa caldo*, French *il fait froid*, *il fait chaud*, *il fait du vent* (cf. *il y a du pain*). We are still animistic in our modern culture when we say *the wind shakes the house*, *the lightning killed a man*, French *le tonnerre gronde*, *le vent chasse les nuages*, Spanish *la tempestad ruge*. Even the "impersonals" indicating sentiments or feeling, such as Latin *mē taedet*, *mē miseret*, *mē paenitet*, *mē piget*, *mē pudet*, German *es gelüstet mich*, *es gemahnt*

mich, *es graut mich*, *es schaudert mich*, where again the accusative of the pronoun shows clearly that an active, unknown, mysterious force is hidden behind the verb. We can compare such expressions as *love overcame him*, *anger vanquished him*, Italian *l'odio si impadronì di lui*, *l'ira lo vinse*, *il terrore lo prese*, *amor mi mosse che mi fa parlare*, Greek *τρόμος δέ Φοι ἔλλαβε γυῖα*, *ἔρος αὐτε με λυσιμέλης δόνει*, etc.

In this problem, as in all linguistic problems, we must not compare linguistic categories with extra-linguistic realities as we see them today (as does, e.g., Bloomfield, *Language*, p. 271 ff.), but as they were seen and conceived in the time when these categories were formed. Language, a historical reality, can never be grasped without a deep understanding of history and of the changes of human conceptions throughout time.

Sec. 17. *The General Linguistic Trend Towards Abstraction.* The human mind tends more and more towards an abstract way of thinking; it is therefore natural that it has to find and create, by different means, a large number of abstract nouns and verbs capable of expressing new ideas and concepts. We can easily observe, therefore, that the passage from a concrete to an abstract meaning is very frequent, whereas the inverse is rare. This is one of the most evident characteristics of lexicological change. Bloomfield himself, an enemy of "mentalist" methods, gives in his book *Language* (pp. 429 f.) some good examples and seems to admit that this change is general: "The surface study of semantic change indicates that refined and abstract meanings largely grow out of more concrete meanings. [. . .] This [. . .] gives us some measure of probability by which we can judge etymologic comparisons." Centuries ago, Giambattista Vico, the Italian philosopher, had already clearly pointed out this important phenomenon. It is hard, he tells us, to enter the imagination of primitive men "le menti dei quali di nulla erano astratte, di nulla assottigliate, di nulla spiritualizzate, anzi tutte sprofondate nei sensi, tutte rintuzzate dalle passioni, tutte seppellite nei corpi [. . .]. La sapienza poetica, che fu la prima sapienza della gentilità, dovette incominciare da una metafisica non ragionata ed astratta qual è questa degli addottrinati, ma sentita ed immaginata quale dovette essere di tai primi uomini, siccome quelli che erano di niuno raziocinio e tutti robusti sensi, e vigorosissime fantasie [. . .].

Quanto prima avevano sentito d'intorno alla sapienza volgare i poeti, tanto intesero poi d'intorno alla sapienza riposta i filosofi; talchè si possono quelli dire essere stati il senso e questi l'intelletto del gener umano."

I will add here at random the following material. The English word *idea*, perhaps the most abstract of all words, is the Greek *ἰδέα*, which comes from the root **wid*—'to see' (older meaning in Greek *εἶδον*, 'I saw,' Latin *uideō*, Russian *vidjet*, etc.). In English *wise*, *wisdom*, we find another abstract offspring of the same root. English *sage*, French *sage*, *sagesse* come doubtless from the Latin *sapidus* (*sapiō*, *sapor*) 'having the taste of something.' Again a passage from a physiological sensation to an intellectual notion. The Latin *cogitare* 'to think,' 'to cogitate' is a compound of *co-* and *agitare* 'to agitate' (meaning 'to agitate something within one's mind, with oneself'). Italian *pensare*, French *penser* are nothing but half-learned parallel forms of *pesare*, *peser* 'to weigh' (Latin *pēnsāre*, from *pendere*, cf. English 'to ponder,' 'to weigh'). The *concept* is 'that which is grasped together' (cf. English *to grasp*, *to understand*), from *cum* and *capio*. *Subject*, *object* come from the verb *iacio* 'to throw' and the prepositions *sub* and *ob*. *To consider* comes from *cōsiderāre* 'to gaze at the stars,' and *dēsiderāre* has a similar origin ('to ask something from the stars'). *Animus*, *anima* come from a root meaning 'to blow,' 'to breathe,' cf. Greek *ἀνεμος* 'wind,' etc., and so does *spirit* (*spiritus*, *spirāre*), Hebrew *ruah*, Sanskrit *ātman-* (cf. German *Atem*), Russian *duśā*, *duch*, *dyšat*, Greek *ψυχή* (*ψύχω*), *πνεῦμα* (*πνέω*). *Matter* (as opposed to *spirit*), French *matière* goes back to a Latin word meaning 'construction wood' (*māteriēs*), and so does Greek *ὕλη*. *Θυμός*, 'vital force,' 'courage,' has preserved its old meaning in Latin *fūmus*, Russian *dym* 'smoke,' etc. The verbs meaning 'to be' (*be*, *was*, *is*) or 'to become' (German *werden*, Greek *γίγνομαι*, Latin *fiō*, French *devenir*, Spanish *ponerse*, *llegar a ser*, etc.) show a similar development, for 'to be' and 'to become' are very abstract conceptions.

The inverse process also exists, as I said, but is much rarer: cf., e.g., Latin *anima*, which in Romanian took the place of *cor* 'heart' (vice versa, 'heart' has taken an abstract meaning in many modern and ancient European languages: English *he has a good heart*, French *il n'a pas*

de coeur, etc. German *die Wache*, Spanish *el justicia*, *el policía*, French *le nourrisson*, English *justice of the peace*, Russian *sirotá* are now concrete.

Sec. 18. *The Linguistic Trend Towards Generalization*. Closely connected with the trend towards abstraction is the trend towards generalization (general classifications, categories, concepts). The primitive man understands only concrete objects, and therefore individual objects. His mind is incapable of grasping the common features that lie beneath apparent differences in things—which is, of course, a typically logical operation, the basis of all philosophical thinking. A *white cow* is for him entirely different from a *red cow*; he does not see or value the resemblances between the two animals. From his conception to monotheism, pantheism, and the now dominating monistic philosophies, the way is long, but the trend is continuous. Primitive tribes in all corners of the earth lack such general words as *fish*, *tree*, *bird*, *animal*, or even *cow*, *parrot* or *palm*, but they have many words for every sub-species of fish, cow, parrot, or palm (cf., e.g., Jespersen, *Language*, pp. 429 f.). And this is equally true for adjectives and verbs. "The Mohicans have words for cutting various objects, but none to convey cutting simply" (Jespersen). The same situation can be easily reconstructed or even directly observed in Indo-European languages, such as Lithuanian, which has no general word for 'gray' or 'red,' but has a word for 'gray' when *wool* is so qualified, another for *horses*, another for *cattle*, and still another for the *human hair*. The same thing occurs in the case of other colors.

Therefore, in cases like German *Lachs* 'salmon,' meaning 'fish' in Tocharian (*laḡs*), or of the Greek *δρῦς*, meaning both 'oak' and 'tree' (cf. also English *tree*, Russian *djérjevo* 'tree,' 'wood,' etc.), we can safely admit that the narrower meaning ('salmon' resp. 'oak') is the older (cf., e.g., Boisacq, *Dictionnaire étymologique de la langue grecque*, Heidelberg-Paris, 1923, p. 203; S. Feist, *Etymologisches Wörterbuch*, p. 481); although, of course, the inverse case (narrowing of meaning) is also known (cf., e.g., Latin *necūre* 'to kill' > French *noyer* 'to drown'; Latin *pōnere* 'to lay,' 'to put' > French *pondre* 'to lay eggs'; Latin *sēparare* 'to separate' > French *sevrer* 'to wean'; Vulgar Latin *labōrāre* 'to work' > French *labourer* 'to till,' 'to plow.'

Sec. 19. *Anomaly in Grammar.* Anomalous, irregular forms, called very improperly suppletive, are usually old, for the very simple reason that analogy, the trend toward equalization of paradigms and even toward the formation of paradigms, works constantly toward the elimination, not the creation of irregular or suppletive forms (such as French *je suis, je fus*, Latin *ferō, tulī*). It is clear that such a paradigm as *amō, amāui, amātus, amāre* is recent. This analogy is after all only one current in the great river of generalization of which we have spoken in the preceding section. The psychological urge is identical in both cases, only in one it acts on vocabulary, in the other on morphology (on the value of this distinction, see below). On this point, Jespersen has given the right answer (*Language*, p. 426): "In an interesting book, *Vom Suppletivwesen der indogermanischen Sprachen* (1899), H. Osthoff has collected a very great number of examples from the old Aryan [Indo-European] languages of different stems supplementing each other, and has pointed out that this phenomenon is characteristic of the most necessary ideas occurring every moment in ordinary conversation [because these words are always better preserved, for obvious reasons. G. B.]: I take at random a few of the best-known of his examples: French *aller, je vais, j'irai*, Latin *ferō, tulī*, Greek *horaō, opsomai, eidon*, Latin *bonus, melior, optimus*. Osthoff fully agrees with me that we have here a trait of primitive psychology: our remote ancestors were not able to see and to express what was common to these ideas; their minds were very unsystematic, and separated in their linguistic expressions things which from a logical point of view are closely related."

Sec. 20. *The Creation of the Article.* Another interesting case is offered by the creation of the article, which is very definitely a sign of linguistic progress. We can observe its birth and growth in many languages, but never its disappearance. It is exactly the opposite of the dual. The psychological reason is given by Sommerfelt, *La langue et la société*, pp. 196 f.: "It cannot be doubted that the development of linguistic categories, just as of other facts of material and spiritual civilization, is explained by the differentiation of society under the effect of the necessities of social work [. . .]. The Latin word *petra* means at once 'the stone,' 'stone' and 'a stone.' The article has come to

express the more concrete meaning, 'the stone in question,' while the old form, without the article, represents the general meaning. It is only when the need was felt to distinguish the general meaning from the concrete case that the article was created; the new form provided with the article corresponds better to the meaning of the Indo-European noun than the old form without the article. Perhaps the same happened in the case of the adjective and the noun."

Sec. 21. *Poetical Character of Semantic Changes.* Besides the general semantic trends we have indicated above, other changes are found in vocabulary. They have been classified in a series of works, some of which are cited in the bibliography, and we need not go into details here. We find in semantic change, besides the trend towards generalization or an extension in meaning which we have considered above, the restriction in meaning (much rarer than the opposite), as in French *pondre*, 'to lay (an egg),' from the Latin *pōnere* 'to lay,' or in *hound*, originally meaning 'dog'; the degeneration, as in *knave*, formerly meaning 'servant' (cf. German *Knabe*); the elevation, as in *knicht*, originally meaning 'servant' (cf. German *Knecht*), etc. The chief characteristic of semantic change, however, is that (if we disregard those of a purely social nature, such as *marshal* from *maréchal* [-*ferrant*]), which strictly speaking do not belong in an Encyclopedia of Psychology) it can be, and usually is, defined in terms of rhetorical, that is, poetical figures, such as metaphor, metonymy, synecdoche, hyperbole, litotes, antonomasia, pleonasm, ellipse, prosopopoeia, catachresis, irony, euphemism, and so on. Croce's philosophical identification of language with poetry is entirely confirmed from the technically linguistic side. The German who first said *Augenstern* for 'pupil,' the Norseman who first said *vindauga* ('window') 'eye of the wall,' the first Greek who said *ψυχή* 'soul' for 'butterfly,' the first Italian who used *pacare* 'to pacify,' with a twinkle in his eye, in the sense of 'to pay' (*pagare*) were poets, in their own humble fashion, and the eternal sparkle of Dante and Shakespeare was kindled for a moment in their hearts.

Sec. 22. *The Names of the Pupil.* If we open again the *Linguistic Atlas of Italy*, at map No. 101 (*occhio*), we will notice that representatives of the Latin word *oculus* occupy without

a single exception (excluding the Albanian and Greek localities) the whole map. The same can be said more or less of most of the other parts of the body, such as 'foot' (*pie*de), 'forehead' (*fron*te), 'knee' (*ginoc*chio), 'bones' (*ossa*), 'skin' (*pelle*), 'blood' (*sangue*), 'vein' (*vena*), 'ear' (*orec*chia), etc. But if we look at the side of the same map *occhio*, where a few names for 'the pupil' (of the eye) are reproduced, we will be struck not only by the great variety, but by the peculiar character of these names: human fantasy has taken here its most audacious flights. The Latin name *pupilla* (literary Italian *pupilla*) is rare; we find in its place *la lūmeta* 'the little moon,' *il lūmin di òc* 'the little lamp of the eyes,' *la lūz di òc* 'the light of the eyes,' *la pūitina* 'the little one,' *l'animeta dey oçu* 'the little soul of the eyes,' *la madunena* 'the little Madonna,' *la puparella dal oççg* 'the little doll of the eye,' *la pallotta dal uçç* 'the little ball of the eye,' *la vetrella* 'the little glass,' *la palum-mell*^a 'the little wood-pigeon,' *a ninne del uoçç* 'the girl of the eye,' *la tsitts*^a 'the teat,' *l'uom dal uoçç*^a 'the man of the eyes,' *a siñurell*^a 'the little lady,' *a prunedda* 'the little plum' (cf. French *la prunelle*), *l'ancaléda* 'the little (female) angel,' *la luccglell*^a 'the little firefly,' and other more or less obscure words. More would surely be found if the map were complete, and can be found in dialectal dictionaries or special works (e.g., French *voyant*, Sardinian *candela di ogu*, *laddara* 'gall-nut,' etc), like that of Zauner in *Romanische Forschungen*, Vol. 14, 1903, pp. 336 ff., or of Wagner, *Studien über den sardischen Wortschatz*, p. 71. We could be tempted to attribute this outburst of imagination to the artistic nature of the Italians, which, of course, in general cannot be denied. But in this case, this is at least doubtful, for we find *Augenstern* 'star of the eye' in German, *anha* 'lamb' in Provençal, *pupilla* (from *pūpa* 'doll,' 'girl') in Latin, *κόρη* in Greek, *prunelle* in French, *niña* in Spanish, etc. Obviously the little dark, perpetually moving spot in the eye where a little image appears and which seems to concentrate in itself the very mind and soul of man, cannot be put on the same level with words like 'foot' or 'ear' or 'knee,' or even 'eye,' which are at least to our modern minds simply prosaic indications of objects. There is something else here, and something much more important than the mere need of communicating an idea to another man.

Sec. 23. *No Semantic "Laws" Exist.* No semantic "laws" exist, or can exist, of course, just as no "phonetic laws," or "morphologic laws," or "linguistic laws" in general can either. Language is poetry—that is, creation and freedom—and no "laws" can be imposed on man as he creates language any more than when he creates a work of art. This does not mean that language is chaos, for a work of art is not chaos, and moreover it would be just as incomprehensible as a chaotic work of art (which is a *contradictio in adiecto*). Dante was entirely free when he wrote the *Divina Commedia*, free to write or not to write, to choose this or that subject, to treat it in one way or another, viz., to use hendecasyllables or other verses, to divide it into fifty or a hundred or two hundred songs, to introduce this or that person with these or those words or expressions or thoughts, and so on. But all these possible variations do not mean at all that the *Divina Commedia* is arbitrary, chaotic or absurd; it has its inner logic, which makes out of it a well-rounded whole, which reflects the inner harmony of Dante's sublime personality. This inner logic is of course a human, interior, and artistic logic, not the abstract, mathematic Cartesian or Aristotelian logic. So it is with language, which has its own interior logic and harmony, its system, not imposed from without, but given from within, by the logic of its own existence.

Semantic changes are, therefore, logically unexpected and strange, although psychologically quite understandable. There is no necessity in them. When the European peoples entered into a commercial culture, they had to create (or recreate) verbs meaning 'to pay.' Such a concept can recall to us several ideas, such as 'to disburse money,' 'to become poorer,' or metaphorically 'to cut one's leg,' and the like. As a matter of fact, none of these was ever used, but other expressions were. German said *bezahlen* 'to count (the money)'; Latin said *soluere* 'to dissolve,' 'to destroy' (an 'obligation'); Vulgar Latin changed the verb, and chose *pācāre* 'to pacify' (scil. the man who asks for his money). What impressed the Vulgar Latin speaker was not the juridical obligation (which was essential for the juridically minded ancient Roman who used *soluere*) but the idea of getting rid of a creditor who bored him with his angry insistence. Each language was free to choose its own way of expressing the same idea. None

was logically necessary, as is proved by the fact that the origin of each of the three words is entirely different.

However, it is a fact that certain mental associations, although not quite evident or immediate to us when we think logically, are so frequent in many different languages as to suggest that they must come immediately to the mind of the speaker when he is looking for a word. We have seen above that in many different languages the 'pupil of the eye' is a girl (many more examples could be added), an image which is by no means necessarily suggested by looking at the pupil (nor is the pupil always called like this!). Likewise, when the European languages had to find a new word for the new idea of 'work,' almost all of them went back to the idea of 'labor,' 'hardship,' 'torment,' 'torture' (German *Arbeit*, French *travail*, Italian *lavoro*, English *work*, *toil*, *labor*, etc.). This was obviously how work impressed them psychologically, although other solutions (such as 'production,' 'way of earning money,' 'fatigue,' 'exertion,' 'exhaustion,' 'duty' or what not) seem to be just as good to us logically. The idea of 'wretched,' 'miserable' frequently evolves from words meaning 'foreigner,' 'prisoner' (German *Elend*, Italian *cattivo*); words meaning 'wicked,' 'bad' from words meaning 'sad,' 'wretched,' 'unfortunate,' 'miserable' (Italian *cattivo*, *tristo*, *disgraziato*, *sciagurato*, English *wretch*, French *mauvais*, *un misérable*, *méchant*). So we have seen above that words for 'soul,' 'spirit' almost regularly come from words meaning 'to breathe.'

Language, I would like to stress, is spoken by men, and men do not see reality as it is, objectively and scientifically, but as it impresses them subjectively; man as a speaker, a creator of language, is not a mathematician, a logician or a scholar: he is rather an artist, an eternal child, a creature of emotions, fears, strivings, desires, and dreams. Instead of imposing our theories upon language, we should learn from it. It has much to tell us. Voltaire saw this fact, and expressed it with his usual clarity, writing: "aucune [langue] n'a pu être formée par une assemblée de logiciens." (*Dict. philosophique*, article *Langue*).

Sec. 24. *National Psychology in Lexicon*. But besides these universal tendencies based on the common elements of human nature, there must be some trends and facts characteristic of a

single nation, which reveal to us the peculiar mentality, for example, of the Germans, the Russians, the Italians. These are not easy to find, even if we take into account the reservations made in Section 10. For some reason, it is much easier to discover the universal psychological trends of language or the individual psychological characteristics of the language of an individual than national characteristics.

We will, of course, omit those linguistic facts which reflect social or material conditions, such as *marshal* from French *maréchal*, originally 'shoeing-smith' (cf. *maréchal-ferrant*). The *marshal* was once the 'shoeing-smith of the king,' a post of great honor in France. It became later a title of command in the French Army. This change is entirely dependent on social and political conditions in France, a country once having a strong and respected monarchy. It could not have happened in Italy, the land of the free Republics and Comuni. But this semantic change betrays little of the psychology of the French nation, except that its social structure was once strongly monarchistic. These and other facts belong in an Encyclopedia of History or Social Sciences, rather than in an Encyclopedia of Psychology.

But in some cases a nation's way of life, its interests and occupations influence so much its way of thinking that they are strongly reflected in language, even outside of the technical sphere to which they originally belonged. It could be shown how art and music have influenced Italian, how many expressions and semantic changes in German have originated in the army, how hunting, the chief occupation of Medieval French noblemen, has introduced into the common language a series of words. The American language is full of expressions drawn from the world of business, industry, and sports, things which have a great importance in American civilization (cf. e.g., *handicap*, *knock out*). We will consider here the case of archaic Latin. The ancient Latins, Marouzeau says, were chiefly a people of peasants—a fact proved by abundant historical and literary sources. The strong, patient, courageous, and parsimonious Roman peasant was the backbone of the Republic. His virtues were always considered the ideal of Roman character. This, Marouzeau says, is reflected very much in the language. 'To consider' is in Latin *putāre* 'to prune'; 'the good man,' *ēgregius*, is 'the one (sheep) chosen from

the flock'; *aggregāre* was 'to add to the flock' (cf. also *congregāre*, *sēgregāre*); 'rich' is *locuplēs*, 'the (man) full of land' (from *locus* and the root **plē-* of *plēre*); 'poor,' *pauper*, was originally applied to a field which 'produces little' (from *pau-*, cf. *pau-cus*, *pau-lus*, Engl. *few*, and *pariō*); *dēlīrāre* 'to be delirious' meant originally 'to go out of the furrow' (cf. *lira* 'furrow'); *praeuāricārī* 'to prevaricate' was applied in the beginning to the plowman who plowed crookedly (cf. *uārus* 'baker-legged'); *stimulāre* 'to stimulate' was 'to goad (oxen)' (cf. *stimulus*); 'to hasten (an enterprise)' was 'to mature it,' *mātūrāre*; *laetus* 'joyful' was applied originally to a field well-manured (cf. *laetāmen*, 'dung'; Italian *letame* 'dung'); *fēcundus*, *fēlix* were applied to productive trees (*fēlix arbor*); 'a country' is in Latin *ager* 'the field,' (*ager Nōricus*, *ager Hirpinus*, etc.); even the usual verb meaning 'to do,' 'to be active,' which was very close to becoming a vicarious verb, as *to do* in English (*how do you do?* = *quid agis?*), once had the meaning 'to push (the flock).' It is a known fact, already remarked by the ancients, that the best Roman families had names taken from the land, as *Porcī*, *Asinī*, *Fabiī*, *Lentulī*, *Cicerōnes*, *Caprārī*, *Ouidī*, etc. To be called *Ouicula* would be an insult to modern man; it was a compliment for a Roman.

On Italian, we may read e.g., the opinion of such a prudent scholar as Bourciez, *Éléments de linguistique romane*,³ Paris, 1930, p. 505: "Above all, Italians are a race of artists: we can feel that in an adjective like *leggiadro*, where from the idea of lightness, of slimness, they rapidly pass to the meaning of 'pretty,' 'agreeable'; likewise in *vago* 'wandering,' which arrives to the meaning of 'charming' through intermediary of the language of painters where it indicates the hazy and vaporous of a picture. See finally how out of *disinvolto* (= **dis-inuolūtus*), that is, 'disencumbered of that which enveloped it,' has successfully emerged an idea of ease and freedom in manners."

Similar remarks, making an interesting coincidence, may be found in J. Schrijnen, *Einführung in das Studium der indogermanischen Sprachwissenschaft* (trans. Fischer), Heidelberg 1921, pp. 70-1: "But language is also an artistic construction, the expression of the varied life of concepts and feelings. It is a spiritual product of art of the various social conditions. One speaks

not only because of the need for social communication, but also out of pleasure and leisure. This is clearly seen in children and common people who sometimes cannot help but give free rein to their necessity for speaking. Speech in the widest sense of the word is an utterance of beauty, and as such its chief requisite is strength and power to express and to distinguish nuances. The capacity of Italian for example to make from *casa* words like *casino*, *casina*, *caserino*, *casetta*, *casella*, *caserella*, *casuccio* [read *casuccia*] on the one hand, *casaccia*, *casone*, *casatto* [read *casotto*], *caserna*, *casamento* on the other hand in order to express the concepts or rather the shades of feeling 'little-lovely, big-crude'—this capacity proves that the people form and transform, understand and feel their language with an artistic sense. It evidences the strongly pronounced feeling of the language on the part of the Italians and the high expressive value of the Italian suffixes." Alfred de Musset, a French writer of delicate feeling, although not a linguist, understood another Italian quality when he wrote in *Le fils du Titien*: "*Simpatica*, Italian word of which our language [= French] does not have the equivalent, perhaps because our character does not have the equivalent of that which it expresses." (cf. H. Schuchardt, *Literaturbl. für germ. und romanische Philol.*, 39, 1918, p. 285). It is therefore not at all a chance that W. Somerset Maugham, in his novel *Up at the Villa* (Doubleday, Doran and Company, New York, 1921, p. 152), in reproducing in English the speech of some Italians, leaves the word *simpatico* untranslated: "They'd let him owe money for three weeks because he was so *simpatico* [. . .]"

And who does not feel the heritage of classical moderation and wisdom in Italian *accorto*, *prepotente*, *senno* (although this is a word of Germanic origin), the French elegance and *finesse* (!) in French *joli*, *chic*, *charmant*, *déli-cieux*, *adorable*, *nuance*, the English morality in *fair-play*, *gentleman*, (*good*) *sport*, *shocking*, the German romantic feeling in words like *Sehnsucht*, *schmachten*, *hinsiechen*, *Wahnsinn*, *bange*, *Stimmung*, *Weltschmerz*, *Gemüt*?

Words typical of a country and of a culture are, of course, difficult to translate into another language; they are usually simply introduced in foreign tongues without any change. So the French word *nuance*, which expresses most of

the secret charm of French art and literature, and of French culture in general, has penetrated *sic et simpliciter* into the great neighboring languages, English, Italian and German, because no native word was available to express exactly that *nuance* of meaning. One of the most characteristic and illustrious French poets, Verlaine, wrote in what is rightly considered the *manifesto* of his school, the poem *Art poétique*:

Car nous voulons la Nuance encor,
Pas là couleur, rien que la nuancel
Oh! la nuance seule fiancé
Le rêve au rêve et la flûte au cor!

The English word *gentleman*, concentrating all the qualities of correct behavior, good manners, honesty, loyalty, endurance, seriousness of purpose, that have made the English nation great, is frequently used in its English form in continental Europe to designate, e.g., a native Frenchman, Italian or German who possesses, or is supposed to possess, the qualities that the word indicates.

Sec. 25. *National Psychology in Grammar*. This demonstration is not very difficult, in some cases, for the vocabulary; it is much more so for grammar. Several attempts have been made, as stated above, especially by German scholars, but not all of them have met with undivided approval. I will mention here the recent work of a very brilliant American young lady who studied under Spitzer, Anna G. Hatcher, of Johns Hopkins University. In a careful comparison between the reflexive use of verbs in Latin, Old French, and Modern French (*Reflexive Verbs, Latin, Old French, Modern French*, Baltimore, London and Paris, 1942). Miss Hatcher reaches important conclusions. She writes e.g. (p. 149): "As for the type *soi apercevoir*, which represented the combination of a verb of apperception plus *soi* = 'one's situation' (*son estre*), most of the verbs formed in Old French have remained [in Modern French]: *s'apercevoir de*, *se connaître à*, *s'aviser de*, *s'oublier*, *se reconnaître à*. From the first three, the idea of 'awareness of one's situation' has faded. But all of them alike are merely relics: monuments of another age in which there prevailed a different attitude toward the Self—according to which the Self that could be perceived by the subject was only Self-in-a-certain-situation. But in the modern language *son*

être has a reference more 'essential' than had Old French *son estre*: it represents the Self, the Ego, the *Moi*. Today it is considered possible to contemplate the Self as an isolated entity (cf. *s'analyser*), and an *apercevoir soi-même* if coined today would be quite a different verb." And elsewhere (p. 155): "In Old French [...] such verbs [of self-restraint, as *se modérer*, *se retenir*, *se reprimer*, *se vaincre*, etc.] were rare, and even so, were regularly used negatively—with the exception of *se contenir*, frequent in the more courtly literature. The exuberant heroes of the Chansons [de geste] were portrayed more often as expressing than as repressing themselves. But with the verbs above we are back once more in the Ciceronian [Stoic] atmosphere of *sē cohibēre*, *reprimere*, *coercēre*, etc."

Such studies are of the greatest importance, and, even if we are not convinced of their results, we should by all means encourage them, because they tackle one of the most difficult and important problems of linguistics and psychology. But for the moment, I remain in doubt whether many of the facts pointed out so cleverly by Vossler, Spitzer and their followers might not be explained in terms of general human evolution, according to Sec. 14, with the modification perhaps offered by Vico's theory of the *corsi e ricorsi* (recurrent phases of history). The Middle Ages, the epoch of the Chansons de Geste mentioned by Miss Hatcher, could perhaps be, from certain points of view at least, a relapse into more primitive, mystic and barbaric ways of thinking, whereas the French world after the Renaissance, under the influence of Italy, takes up again the philosophical, rational and scientific trend of Classical Antiquity. This could explain the affinities in linguistic expression between the Modern and the Pagan world as opposed to the Middle Ages. But the French development would then be, more than something specifically French in the national sense, an episode in the great march of all humanity from a mystic to a rationalistic and objective conception of the world. The same can be said of the excellent studies of the Swiss-French scholar Charles Bally.

Sec. 26. *Language and Folklore*. Folklore and superstitions of every kind play an important part in language, more perhaps than scholars usually believe. One of the animals around which popular fantasy has woven many tales is

the weasel. In Aesop's fable "The Weasel and Aphrodite" (88 edition Halm, p. 43; 76 edition Chambry; 50 edition A. Hausrath, *Corpus fabularum aesopiarum* I, Leipzig, 1940, pp. 69 f.), "a weasel falls in love with a handsome young man, and asks Aphrodite to change her into a woman. The goddess takes pity and transforms her into a beautiful girl; and so the young man, seeing her and falling in love with her, brings her to his house. But while they are sitting in the matrimonial room, Aphrodite, wishing to know whether the weasel was transformed in nature as well as in body, sends a mouse into the middle of the room, and she [the weasel], forgetting all the present things, rises up from the couch and hunts the mouse, to eat it. And the irate goddess restores her to her old nature."

This and many other legends and superstitions are reflected in the names of the animal. In England she is *the fairy*, in Bavaria *jüngerchen* 'little virgin,' or *Schön-tierlein*, *Schöndinglein*, in Westphalia *Fröie*, in the Sette Comuni *Vraule* (= *Fräulein*), in German Moravia *Gevatterlein* 'little god-mother,' in Old Czech *panna* 'young lady,' in Georgia *dedop'ala* 'queen,' in Modern Greek *νυμφίτσα* 'the bride,' in Serbian *nevestica* 'bride,' in France *la belette* 'little fair one' (from *belle*) or *daunabera* 'the beautiful lady' (*domina bella*) or *poulido* 'the pretty one' (from the Latin *pōlita*), in Spain *mona* 'the pretty one,' *comadreja* 'god-mother,' *norinha* 'little daughter-in-law,' *donociña*, *paniquesa* (from *pan* y *queso* 'bread and cheese'), *garridiña* (perhaps 'thrifty one'), in continental Italy *bejanuccia* 'the Epiphany' (usually represented as an ugly old woman, bringing gifts to children), *massairela* 'the little housewife,' *panakasu* (from *pane* e *cacio*), *donnola* 'the little woman,' *mannakēda* 'little nun,' *tsitola* 'little one,' *kuca* 'little dog-bitch,' in Sardinia *yand'e muru* 'fairy of the wall' (also by popular etymology *yanna* or *enna* e *muru* 'door of the wall'), *comar' Anna* (cf. St. Anne), *anna e muru*, *dana e mele* 'fairy of the honey,' *nonna e mele* 'the godmother of the honey,' *can e meli* 'dog of the honey,' *melimbukka* 'honey in the mouth,' *bukkameli* 'honey-mouth' (and further by popular etymology *bucca e mela* 'mouth of the apple,' *nae de mela* 'boat of the apple'), and many others. English *weasel* is perhaps 'the gay one' (connected with Russian *vjesjē* 'gay'); cf. the Latin name *hilaria* (Keller, *Die antike Tierwelt*, p. 164).

Many other animals and plants offer similar phenomena, such as the *owl*, the *fox*, the *dragon-fly*, the *firefly*, the *spider*, the *turtle*, the *butterfly*, the *bat*, the *dove*, the *squirrel* (from Greek *σκίουρος* 'he who shades himself with his tail') and others, and their names are sometimes difficult to understand: man's imagination, once stirred, works fast and with no concern for mere logic or investigating scholars. But it is clear that there is no hope of understanding any of these facts without a mind open to the real workings of the human psyche and a thorough knowledge of popular beliefs and superstitions.

Sec. 27. *Linguistic Taboo*. The problem of linguistic taboo is so closely connected with that of the preceding paragraph that it is frequently difficult to keep them apart. We can define *taboo*, in its original meaning, as the avoidance of a word (and its replacement by another word) caused by fear of a supernatural power. The most frequent taboo is, of course, that of the supernatural being itself (god, demon, etc.). Sometimes the god (or goddess) is called 'the good one,' even if he is dangerous and cruel, and particularly if he is dangerous and cruel. The Greeks said *Εὐμενίδες* 'the benevolent ones,' instead of *Ἐρινύες* (these goddesses are surely *not* *Εὐμενίδες*!); the Romans called the infernal gods, who take our lives from us, *Di mănēs* 'the good ones'!

Names of wild animals are frequently taboo, probably because they were free beings, independent of man, demon-like and sometimes incarnations of men. "Bear" was doubtless taboo among some Indo-European peoples: cf. Russian *mjedvjéd* 'the honey-eater,' English *bear* 'the brown one,' etc. English *hare*, German *der Hase* was once 'the gray one,' Greek *λαγώς* 'the slack-ear.' Some parts of the body are also conceived as living beings, as dangerous forces (see above). Most Indo-European words for the parts of the body are stable, e.g., *the heart*, *the knee*, *the tooth*, *the ear*, *the brow*, *the eye*, *the chin*, *the foot*, etc., all of which are in English old Indo-European words, easy to find in Latin, Greek, Slav, etc. But the names of *the hand*, *the finger*, and *the hair* vary constantly, so that it is absolutely impossible to reconstruct any Indo-European form for them. However, since the Indo-Europeans possessed these parts of the body, and since they certainly mentioned them, and since we see no other reason why these

words should have been eliminated, we must conclude that the old words were tabooed. As a matter of fact, *the hair, the hand, and the finger* are believed to have terrible magic powers (cf. the hair of Sampson, 'the hand of God,' etc.).

Linguistic taboo is extremely strong among primitive tribes, as is known from innumerable reports of missionaries and scholars. But it is also known, e.g., in classical and Jewish antiquity. The *flāmen dīālis* at Rome could not touch raw meat, ivy, a she-goat, beans, corpses, nor pronounce their names. The Jews were (and are still) not allowed to pronounce the name of Jehovah. Linguistic (and also non-linguistic) taboo still exists in our modern society, although to a much more limited extent. We say *the Lord* or *the Almighty* for *God*, *our Lady* or *the Virgin* for *Mary*, etc. And even such deformations as American *gosh* for *God*, *heck* for *hell*, French *sapristi*, *parbleu*, *pardi* for *sang Christi*, *par Dieu*, Italian *cribbio* for *Cristo* and *madosca* for *Madonna* can well be classified as taboo. But the taboo of *the hand, of the finger, and of the hair* seems to have disappeared: Cf. English *hand, finger, hair*; German *Hand, Finger, Haar*; French *main, doigt, cheveu*; Italian *mano, dito, capello*; Spanish *mano, dedo, cabello*, etc.

Sec. 28. *An Uncertain Case: Old Irish súil* 'Eye.' Sometimes we can remain in doubt between several explanations. The Indo-European name for "the eye" (Latin *oculus*, English *eye*, etc.) has been replaced in Old Irish (*súil*) by the name of the 'sun' (Latin *sōl*, etc.): the 'sun' is therefore thought of as 'the eye' of the sky, or of the whole universe (the eye had a radiating power among primitive tribes, and even, e.g., in Dante's times); cf., e.g., Homer, *The Iliad*, 3, 277, ἥελιός θ' ὅς πάντ' ἐφοῶς καὶ πάντ' ἐπακούεις, and see Macdonell, *Vedic Mythology*, p. 307. Is this a taboo? Is it imagination, poetry, superstition, mythology, religion? Shall we think of Italian poetry, in which the eyes of a fair lady are almost regularly compared to suns, of the beautiful verses of Ariosto *Sotto due negri e sottilissimi archi Son due negri occhi, anzi due chiari soli*? After all, is this distinction a very important one? Do not poetry, feeling, imagination, religion spring from the same source in man's soul? The only thing that matters is that all these motives are entirely distinct from logic, philosophy, science,

rational thinking, mathematics; that **no amount** of logics, of utilitarianism or mechanism can ever explain why the Irish called the "eye" "sun," whereas the verses of Ariosto easily can; and that this and most changes of meaning remain entirely incomprehensible as long as language is considered uniquely as a "means of communication," a sort of mathematics for the transmission of bank accounts.

Sec. 29. *Other Linguistic Interdictions.* Some scholars extend the name of taboo to every sort of linguistic interdiction, the fundamental motive being always *fear*. Names of objects or places or persons bringing bad luck are avoided or transformed. The Romans changed the name of the town of *Maleuentum* into *Beneuentum*, the Greeks, the πόντος Ἀξεινος (an Iranian word meaning 'dark,' cf. Avestan *axs'aēna*) into Εὐξεινος 'hospitable, because Ἀξεινος sounded to them like 'inhospitable.' In our modern society, the interdiction of the *left hand* still seems to be very strong; while the names of the *right hand* are more or less the same in the different European languages (the word *right* being very frequently the same as *right*, the opposite of *wrong*, as it is in fact in English), the names of the *left* change frequently: English *left*, German *linke*, Gothic *hleiduma*, Norwegian *venstre*, French *gauche* (of Germanic origin), also *seneko* 'the old one,' Catalan *esquerra*, Spanish *izquierda* (of Basque origin), Italian *manca, mancina, stanca*, Romanian *stîng*, etc.; but cf. English *the right hand*, German *die rechte Hand*, French *la droite*, Spanish *la derecha*, Italian *la (mano) diritta*. The names for the *left* are frequently words meaning 'old,' 'weak,' 'bad,' 'tired,' 'crooked,' 'mutilated,' 'withered,' 'faint,' 'flaccid,' etc., or are foreign words. The left hand brings bad luck, cf. English *sinister* from the Latin *sinister*, Italian *un sinistro* 'an accident,' etc., or has in general a bad connotation: French *gauche* 'awkward,' 'clumsy,' *mariage de la main gauche*. "In Heaven, the good Christians will be seated to the *right* of Christ, the bad ones to the *left*" (cf. Matthew, 25, 33, and the *Dies irae*; cf. F. Ermini, *Il Dies irae*, Geneva, 1928, p. 144: *et ab haedis me sequestra statuens a parte dextra*). Greek ἀριστερός (from ἀστος), εὐώνυμος, Norwegian *venstre*, Old Irish *túath*, etc., are typical taboo names, that is, euphemisms, like Εὐμενίδης (see above Sec. 27).

Euphemisms for 'to die' are frequent and

well known (*to pass, to go west, to de cease, to leave this world, to kick the bucket*, etc., Italian *tirare la calza*, Spanish *espichar, estirar la pata*; cf. also English *to die*, German *sterben*, originally 'to starve,' cf. English *starve*). To *kill* is a verb which changes frequently: cf. English *to kill*, German *töten, umbringen*, Gothic *usgiman*, Greek *κτείνω*, Latin *occidō, interficiō* (also a taboo word: 'to make away with'), Russian *ubit'*, etc. In the Romance languages we have French *tuer* (from *tūtūre* 'to extinguish [a light]'), Spanish *matar*, Romanian *omorā*, Italian *uccidere, ammazzare, accoppiare, scannare, fare la pelle*. The English *to slay* was once 'to beat' (German *schlagen!*), cf. Russian *ubit'*, Latin *occidere*; today such metaphors as *put to sleep, take care of* (Damon Runyon) are frequently used in the United States. On the other hand, such ideas as 'to be born' or 'to live,' where always the same verb is found in the two groups of languages: English *he is born*, (Lucas 2, 11), etc., etc., French *naître, vivre, to live*, German *leben, er ist geboren*, Dutch *leven, hij is geboren*, Gothic *liban, gabaurans ist* Italian *nāscere, vivere*, Spanish *nacer, vivir*, etc., all directly from the Latin *nāscī, vīvere*. Another concept subject to frequent interdictions is *sick, ill*.

A word having a bad connotation, and therefore frequently exposed to changes and substitutions, is 'bad' itself (*wicked, evil*, etc.). If we compare it with its opposite 'good,' we can clearly see the contrast: Dutch *goed*, Swedish and Danish *god*, English *good*, German *gut*, Gothic *gofo*s, but English *bad, wicked, evil*, German *schlecht, böse*, Dutch *kvaad*; and so French *bon*, Spanish *bueno*, Romanian *bun*, Italian *buono*, all from the Latin *bonus*, but French *méchant, mauvais*, Spanish *malo*, Engadinian *nawš* (<*nausea*), Romanian *reū* (Latin *reus*), Italian *cattivo, malvagio, tristo*. On the Linguistic Atlas of Italy we find also *malu* (Sardinia, Sicily, Calabria), *llayru, ttintu, skiffyuz*^u, *nun servi* (verbal), *e mmalamen^a, malit^a, lā^a, foténto* (= 'stinking'), *tsillus^a, trišto, péssama, nom malo* (= 'non vale') *brut^a, gram, marttu, jayí, vilén, möve*; but with two single exceptions we always find the type *buono* (on four maps) for 'good.' The words meaning 'bad' are usually words which formerly had no bad connotation (*cattivo, tristo*, etc.).

A very frequent interdiction is that of the name of the 'mother-in-law' (and, less fre-

quently, of the other 'in-laws'): Spanish *madre política*; *padre político*, Engadinian *sir*; *sira*, Italian (dialect) *madona, ma grānda, nonna, mamma, mama d la moy, matreña, mama d leño* ('mother of wood'), *vava, dudó, la oma da mi jana*; *mase, mun star, babbo, nonno, bab^a da leño, patreño, vec*, French *belle-mère, beau-père, beau-fils, belle-fille* (also *bru*, of German origin), typical taboo-forms (the first two also replace *mārâtre, paratré*, which are used today only in a clearly pejorative sense). The interdiction of all words connected with sex and some other physiological functions is, of course, well known in our modern society, where it seems to be much stronger than it was in the past (it is also much stronger in certain countries than in others).

Sec. 30. *Linguistic Geography; the Connection Between Linguistic Phenomena and Other Activities Proper of Man*. Linguistic geography, a method created by Gilliéron with his *Atlas linguistique de la France* and developed theoretically by the Italian neolinguistic school, has put the entire science of linguistics on a new and extremely fruitful road. While linguistics of the nineteenth century studied language on an exclusively historical (*diachronic*) basis, on the axis of *time*, linguistic geography studies language *synchronically*, in extension, on the axis of *space*. It enables us to see language in its totality, in all its infinite variety. The older school studied each phenomenon separately, comparing *one* French word or sound with a Latin word or sound—and supposing the existence of such blocks like French, Italian, which, when seen on a linguistic map, dissolve into an endless chain of ever-changing dialects and patois. Of the many and important discoveries of linguistic geography, we will stress here the one which is of the greatest interest for psychologists: the birth and diffusion of linguistic innovations, which enable us to penetrate into the most secret mechanism of linguistic creation itself, and to discover its deep connection with all other human activities, such as religion, art, politics, philosophy, literature, superstition, law, customs, clothing, dances, folklore. If we look at any map of the linguistic atlas of France, Italy, Romania, U. S. A., or any other atlas, we find one or two or more names (for 'horse,' 'head,' 'bee,' etc.) or forms which are *perfectly equivalent in meaning*, since exactly the same question was asked at all points

of those atlases (several hundred for each of them). Of these words or forms, one will be older, one younger (in the case of two words; in the case of three or more, there will be a hierarchy of antiquity: A, B, C, and so on: A will be older than B, B older than C, etc.). Limiting ourselves to the case of two words, if we call A the older word, B will be the *innovation*, the new word or form, equivalent in meaning and function to A, which it is gradually replacing, and will replace in the course of time, unless unexpected events happen. It will be easy to observe that, in the great majority of cases, innovations (new words or forms) are born in the great centers of culture of every nation (Paris for France, Florence [now Rome] for Italy) and spread more or less rapidly to the rest of the country, or rather "linguistic area," following with amazing regularity the great roads of communications through great valleys and plains, avoiding for a long time (sometimes hundreds or even thousands of years) the less accessible regions, such as mountains and islands, particularly the latter. We have, therefore, before our own eyes, the history of language itself. Old forms or words are not only preserved in old texts or documents; they are also—and often much better—preserved in the mountains of Rhaetia or in Sardinia (as far as the Romance languages are concerned). If we now turn to other human activities such as art, literature, law, dance, we will notice exactly the same phenomenon—the innovations irradiate from the same great centers of culture (Florence or Paris, in our example), expand on the same lines, and reach at a late date, or do not reach at all, those same isolated areas where the most archaic forms of language are found. Sardinia, where a type of Latin is preserved that is in many respects more than two thousand years old, also presents in law (*vendetta*), customs, folklore, and industrial technique an extremely old way of life. The opposite is true for Paris and Florence (now Rome), great centers of unceasing fermentation, creation and renewal of ideas and habits. The parallelism is absolutely perfect, and reveals language to be nothing else but one of the expressions of the human spirit.

Sec. 31. *Linguistic Prestige*. Another very important conclusion to be drawn from the study of linguistic geography, and one which the Italian neolinguists have particularly stressed,

is the enormous importance of linguistic prestige. It is because of its superior prestige that the French peasant, or even the citizens of Lyons and Marseille, imitates the Parisian word or expression, that of the local baron, lawyer, priest or apothecarian of his village. This linguistic prestige is, above all, a cultural, spiritual, literary, religious, artistic prestige, not a political, military, or economic one. It is the more or less conscious recognition that a certain type of culture, the vehicle of which is a certain language, is superior to one's own. History furnishes us with some striking examples of this fact. It was just after the dreadful catastrophe of the Peloponnesian war, when Athens had lost forever its military and political power, together with its economic prosperity, that the Athenian language spread victoriously over all the Grecian countries, completely uprooting the glorious old dialects, with the insignificant exception of Tsakonian. Later, in the Roman Empire, Latin easily conquered Sicily, Sardinia, Gaul, Spain, Rhaetia, Dalmatia, and Dacia, but it stopped dead at the gates of the Greek world. It never overcame any Greek linguistic area, although the defeated Greeks of the province *Achaia* were subjected to Roman rule just as the other peoples of the Empire. On the contrary, *Graecia capta ferum victorem cepit*, and the Greek language flooded the Latin one with words, loan-translations, syntactic tours and stylistic expressions. Inversely, when the Germanic tribes conquered the Western Empire, they were never able to impose their language in Italy, Gaul, or in Spain, although for centuries they wielded an almost absolute military, political, and economic power, and although even their religion distinguished them sharply from the Romans. What happened was that the Germanic peoples were slowly absorbed, and they adopted in time the religion and language of the conquered. Today we are at a loss to reconstruct the language of the Burgundians, the Goths, the Erules, the Rugians, the Turcilingians, and the Vandals, so thoroughly have they been swallowed up in the Latin-speaking world. It was only when the invaders arrived in overwhelming numbers or destroyed more or less completely the preceding civilization and even the native population, as happened in England, the Rhineland, and Yugoslavia, that the native language was suppressed; and this happened only in relatively peripheral

regions, where the light of Roman culture shone less brightly. It is true that the Arabs were able to assimilate the Roman population in Africa; but, first, this territory was very far from being entirely Romanized (Berber, a pre-Roman language, is still spoken there, and we know Punic was spoken when the Arabs invaded it); and, second, in the time of the Arab conquest Roman culture was in decay—nay, at its lowest—whereas the Moslem world was soaring towards the height of wisdom, learning, and art that have left in Averroes, Avicenna, and the Alhambra monuments of imperishable greatness.

But the most brilliant example of the importance of cultural, and especially of literary prestige can be found in Italy. Florence was only for very short periods the leading political, military, or economic center of the Peninsula. It was not the religious center; it was not always the intellectual center. In military, political, commercial, and economic power, Genoa, Venice, Milan, Naples, Palermo, and even Turin overshadowed it by far. In the domain of scholarship, the glorious universities of Padua, Bologna, Pavia, and Naples undoubtedly surpassed it. Still, the speech of Florence became the cultural language of the whole peninsula and of the three great islands centuries before the political unification of the country in 1870. National unity was the *consequence*, not the *cause*, of the linguistic unification, and this was the result of literary prestige of the great Tuscan writers of the Trecento, especially Dante, Petrarca, and Boccaccio, who all wrote in Florentine, Dante's (but not the others') native dialect. It was merely the beauty of their verses, the charm of their prose that created the Italian language and the Italian nation.

Another example can again be drawn from Italy. From Charlemagne until Dante (800–1300), France was undisputedly the great cultural center of the medieval world, in religion, literature, manners, and custom. Her influence upon Italy, Spain, Germany, and England was enormous. The Italian language preserves deep traces of this. Some of the most common and familiar words, such as *giorno* 'day,' *mangiare* 'to eat,' *arrivare* 'to arrive,' *giallo* 'yellow,' *grigio* 'gray,' *cagione* 'motive,' *ragione* 'reason,' *stagione* 'season,' *trovare* 'to find,' *sovrano* 'sovereign,' *giardino* 'garden,' *viaggiare* 'to travel,' *adagio* 'slowly,' *congedo* 'leave of absence,' *malvagio* 'bad,' 'wicked,' *prigione* 'prison,' 'jail,'

coniglio 'rabbit,' and the suffixes *-iere*, *-iero*, and *-aggio*, which are still very productive today (cf. *aviere* 'member of the air force,' *linciaggio* 'the lynching,' *atterraggio* 'the landing [of an airplane],' etc.), are, without any doubt, of French origin. It was the great personality of Dante which freed Italy from French influences and gave it a language of its own, capable of expressing the great movement that renovated the whole European civilization—the Renaissance. During that period the relation was reversed, and the Italian words and expressions flooded irresistibly all the languages of civilized Europe.

The example of *giorno* is particularly interesting because, as Bårtoli and Spitzer have shown, this word came from Provence to Florence by way of literature. It is now the only word for 'day' in standard Italian and in most Italian dialects.

Sec. 32. *Linguistic Innovations Start from One Individual.* We have seen in the preceding paragraphs that the Italian language was created by Dante: words, expressions, forms created or first used by him were generally adopted and became standard. All great literary languages are the creation of one or a few great authors. Latin would not be as it is without Virgil and Cicero, nor English without Shakespeare and the King James version of the Bible, nor German without Luther and Goethe, nor French without the great seventeenth-century writers. In many cases we can trace the origin of a word or a stylistic fashion to one individual, and fix the exact date of its creation. Cicero created, on Greek models, the words *quōlitās* and *mediētās*; they both came into the Romance languages, and the first one into all civilized languages of Europe. It became one of the most common everyday words, an essential tool for the modern man. The Dutch scholar Von Helmont (1577–1644) invented the word *gas* by deforming slightly the Greek word *χάος*, Latin *chaos*: *paradoxi licentia halitum illum gas uocauit, non longe a chao ueterum secretum . . . Gas et Blas noua quidem sunt nomina a me introducta, eo quod illorum cognitio ueteribus fuerit ignota . . .* Every day, in our own time, biologists, doctors, chemists, and physicists invent new words, such as *vitamin*, *penicillin*, *sulfa-drug*, *prostigmin*, *uranium*, *neptunium*, some of which are used after a few weeks by millions of persons. The individual origin of

linguistic innovations is evident in these cases and can easily be proved. But few modern linguists doubt—contrary to the opinion generally held at the end of the nineteenth century—that all types of innovations (phonologic, morphologic, syntactic, stylistic) start from *one individual*, are accepted by others, become fashionable and spread more or less rapidly. It is the initiative, the activity, the fantasy, the creative power of one single man which modifies, creates or recreates language. His social prestige imposes it upon others and gives it citizenship in the language of the group or of the nation. Here again the element of prestige is essential in linguistic change.

Sec. 33. *Conscious and Unconscious Element in Language.* On the problem of *consciousness* in language, as on most linguistic problems, our ideas have entirely changed in the present century; we can almost say that they are just the opposite of what they were. Just as the neogrammarians, at the end of the nineteenth century, believed that all linguistic changes were *collective*, so they also thought, according to their positivistic mentality, that they were *unconscious, mechanic, inevitable*. Today most linguists (I believe) hold them to be *individual* in their origin and, to a certain extent at least, *conscious, voluntary*. There seems to be little doubt that the effort of learning a language, both for the baby and for the adult, is essentially conscious and that a great amount of attention is concentrated upon the task. Later on, when mastery of the language is attained, speaking becomes, like walking, more and more a habit which we are less and less aware of. But whenever we want to write an important document, to hold a conversation or a speech on which much depends, to compose or read a poem or even the simplest literary prose work, the problem of language emerges before us in all its importance: we study and weigh carefully every word, every form, every sound, lest our pronunciation appear careless, vulgar or dialectal. Even admitting—as is necessary—that the difference between conscious and unconscious is by no means clear-cut, that there is an immense gray zone between these two poles, still it seems that language as a whole belongs more to the first than to the second.

However, many things happen within us which we are not entirely aware of; this is also true in the case of language. An ignorant

French or English speaker will use *tenses* of verbs correctly without knowing their grammatical value, which he would be entirely at a loss to explain. The same holds true for the aspects or the nominal cases or genders of Russian. The entire structure of language is a *thing* which has its roots deep in the realm of the subconsciousness, although not of the unconsciousness. A closer investigation of this interesting field is an important task for both linguists and psychologists.

Sec. 34. *Phoneme.* The Prague School, one of the most important contemporary schools of linguistics, was founded by two distinguished Russian exiles, Roman Jakobson (now at Columbia University) and the late Prince Trubetzkoy. This school has developed with excellent results ideas of De Saussure, the Polish scholar Baudouin de Courtenay, and the Italian neolinguist Bártoli. One of these, the most interesting perhaps from the *semantic* point of view, is the distinction between *sound*, that is, the mere *phonetic matter*, which can be recorded by instruments, and *phoneme*, that is, distinctive *semantic value* of a given sound or complex of sounds, its strictly *functional value* in speech. Let us take, for example, the two sounds *e_c* and *e_o* (closed and open *e*). These two sounds have a semantic value in standard Italian, inasmuch as they suffice to distinguish couples of words: *pesca* 'the act of fishing' is distinct from *pesca* 'the peach' by the mere fact that we have *e* in the first word and *e_o* in the second; and so is *esca* 'bait' and *esca* 'go out' (subjunctive or imperative, third person), *accetta* and *accetta*, *affetto* and *affetto*. The same is true for French, cf. *dé, daie; clef, claie; fée, fait; the, tait; prêt, pré; épée, épais*, etc., and for German, cf. *Ehre, Ähre; sehe, sähe; wehren, wähen*. Now Spanish, for example, also has these two articulations *e* and *e_o*: but in this language the distinction is merely *phonetic, mechanical*, not *phonemic* or *semantic*. It depends exclusively on the surrounding sounds (consonants or vowels), and never distinguishes two words from each other. The vowel *e* is always closed (*e*); for example, in front of *ç* (written *ch*), *l'* (written *ll*), *ñ* and *y*, open (*e*) in front of *x* (written *j* or *g*), *i* and *rr*: *pecho, sello, Peña*, but *teja, oveja, oreja, lejos, peine, seis, veinte, guerra, perro*. In other words, the two sounds constitute but one phoneme for the Spaniard, whereas they are two phonemes in Italian. Both Italians and Span-

iards have in the same degree the physiological capacity (or rather habit) of articulating both sounds (which the English do not have); but only in Italy, not in Spain, does this distinction appeal to the *linguistic consciousness*, that is, have a real *linguistic* value. The well-known linguist Pos writes in the *First International Congress of Phonetic Sciences*, Amsterdam, 1932, p. 137: "The phoneme is in the linguistic consciousness (conscience linguistique, Sprachbewusstsein), ce n'est pas une chose inconsciente." And Van Ginneken so expresses himself in the same volume, p. 11: "The historical linguists' treated until then the sounds as isolated entities, considering them as dead, if not petrified, quantities [grandeurs périmées, sinon pétrifiées], which was the default of Brugmann and of Streitberg, and became a woe with Herman Hirt; phonetic psychology [viz., phonemics] brought back again man's soul, his intelligence, his will and his feeling in the full history of language, which by love of exactitude had remained entangled in a maze of algebraic formulae [dans un réseau de formules algébriques]." And this, we should add, precisely in the field which was considered the most dead, the most mechanic, the most unconscious: phonetics.

The same distinction (called phonemically *opposition*) is found in Italian for *ó* and *ò*: *colpo* and *cólto*, *bótte* and *bòtte*, *accórsi* and *accòrsi*, *vólto* and *vòlto*, *córso* and *còrso*, *fósse* and *fósse* are different words; so it is also in French (*fausse*, *fosse*; *heume*, *homme*; *hotte*, *ôte*; *paume*, *pomme*; *hausse*, *os*; *saule*, *sole*; etc.). Again in Spanish the difference in articulation is produced exclusively by the surrounding sounds: Spanish *o* is open in closed syllable and also when in contact with *rr* and in front of *x*, *y*, *i*; it is closed in almost all other cases: *gorra*, *roca*, *rosa*, *hoja*, *manojó*, *estoico*, *voy*, *hoy*, but *llamó*, *boda*, *moda*, *pollo*.

The importance of this observation is enormous. For the first time it has been possible to define exactly the number of sounds (now called phonemes) of a language and their reciprocal relationship, to group them rationally in *oppositions*. Only now can we say that the whole of phonetics, formerly separated from the rest of language as "the unconscious part of language," has entered into the domain of consciousness, of semantics, that is, of linguistics proper. With phonemics, it can be said, a

new, flourishing and important branch of linguistics was born.

Another important discovery of the Prague School, partly foreseen by the distinguished American linguist Franz Boas, is the concept of *linguistic alliance* (*Sprachbündnis*), which is closely connected with phonemics. *Unrelated* languages can, by geographical contact, enter into an *alliance*, that is, evolve some common features; this alliance has nothing to do with genetic parentship; it is superposed, and in a certain sense opposed to it, since it tends to form new linguistic connections and thereby to erase the old ones. Russian dialects agree in the use of certain sounds with some Finno-Ugric dialects, with which they are entirely unrelated; Czech is the only Slav language with initial accent, exactly like German; French and Gallo-Italic are the only Romance languages possessing the sound *ũ*, like German; Castilian has no initial *f*, like Basque. A language can have the same phonemic (or even morphologic or syntactic) system as another language of an entirely different origin. Phonemic, morphologic, or syntactic maps of Europe or Africa or any other region can be drawn, in which the isoglosses of phonemic, morphologic or syntactic phenomena continually cross what we call the linguistic boundaries in the traditional, genetic sense (French, Italian, German, Czech, Hungarian, etc.); nay, they show no connection whatsoever with the latter.

On this point, as on most other points, the Italian neolinguists entirely agree with the Czech school. The two schools have even progressed very much in the same way.

Another concept hinted at by Bártoli and De Saussure, and further developed by the Czech school is the idea of language as a *system*, an harmonious whole, in which all pieces fit together harmonically. Every change shakes the whole structure, introducing other changes in other parts of the linguistic architecture. Here again, a sort of general will and organizing force seems to be constantly at work, supervising, modifying, improving, curing, mending—sometimes, as happens in life, with bad results. Certainly this theory is equally incompatible with any assertion that language is an unconscious phenomenon, unless we admit supernatural forces superior and exterior to man.

Sec. 35. The "Mechanistic" School; L. Bloom-

field. The entire presentation of semantics in this article has been based upon the general assumption that man is a living creature who thinks and feels, and that his thoughts and feelings are expressed through language, although sometimes in a very imperfect way. This general assumption is admitted today by the great majority of linguists of all countries and schools (cf., for example, Terracini, p. 55); nay, the definite trend in recent years has been more and more to stress the emotive and fantastic element in language, to search its interior logical structure, to identify language with the spirit of man. An entirely opposite point of view is held by an American scholar, Leonard Bloomfield, now professor at the University of Yale, and by his followers. His theory is called by himself *mechanistic* (*Language*, p. 33). According to Bloomfield, there is no proof that man thinks or feels; this is an entirely unwarranted assumption, not proved by science. To speak about the meaning of words or forms, to say that a word expresses an idea or an emotion is unscientific: it is metaphysics or theology. What we really see, in fact, is that a certain phonetic utterance of a man (e.g., *give me an apple*) is followed by a certain gesture of another man (he gives the first man an apple). This does not prove that anything has happened in the minds of the two men, that any idea corresponded to the uttered sounds. The reaction of the second man may very well have been of a purely physiological nature, such as the shaking of the arm if it is pricked by a pin or hit by a stone. Language has to be examined by itself, with its own means, without any connections with other sciences (such as psychology, literature, religion, folklore, etc.). It has to ignore completely human thoughts, feelings, ideas, fantasies and superstition, the entire working of the mind. We have to stick exclusively to *facts*, actions, and reactions that we can see, touch, and measure. Nobody has ever seen or touched or measured the human mind, or thought, or feeling, or the meaning of anything. Every utterance containing the words *mind*, *idea*, *meaning*, or the like, is unscientific and has, therefore, to be eliminated. To admit any link of a thinking process between the words of A, "Give me an apple," and the gesture of B giving A an apple (a mental process like: "A asks me for an apple; therefore I will give an apple to him") is to admit an unwar-

ranted, unproven link, and to follow, therefore, an unscientific method. To explain linguistic phenomena through the *meaning* or the *thought* or the *mind* is to fall into circular reasoning, because what we know about meaning and thought and mind we know only through language, and, therefore, our conclusion is already contained in the premise. Language has to be studied in itself and by itself, without any relation to human thinking, just as the works of a clock.

If such a theory were accepted and rigorously followed (which Bloomfield does not do), the field of linguistics would become extremely narrow; every connection between linguistics and psychology would be impossible, and the whole study of semantics completely eliminated. There would be no place for an article like the present one in an *Encyclopedia of Psychology*, for the linguist has to ignore psychology and the psychologist has to refrain from drawing any conclusion from language. But it is not so: Bloomfield's theory cannot be accepted, and this, for several reasons, some of which we will indicate here.

First of all, the argument concerning circular reasoning, for what it is worth, can be likewise used against Bloomfield's theory, or against any scientific theory in any field of science. For, all we know about Bloomfield's theory, or about any other theory, we know through *language* (oral or written), and if the meaning of language cannot be understood by us, Bloomfield's theory cannot be understood either. It is metaphysics to believe that Mr. Bloomfield thinks, or that any other scholar thinks, or that any scholar can understand (through language), study and approve Professor Bloomfield's theory.

In the second place, Professor Bloomfield (like several other scholars of other schools) always considers language exclusively as a *means of communication*, if not of ideas, of stimuli, as the example of the apple shows, which is taken from his book (p. 32). But as we have seen above in several paragraphs, language is also a means of expressing feelings, wishes, fantasies, and was probably in earlier times much more so than now, in our prosaic and business-like century. (It is known that people whom we consider "backward," such as the Indians, Hindus, and Moslems, are much more poetic in speech than the Americans.) It is even likely that language was born this way, from cries of

love, of fear, and of despair, or as an irrepres-
sible urge to expand one's feelings and dreams,
without any idea of a material purpose:

*Ich singe wie der Vogel singt
Der in den Zweigen wohnt,
Das Lied, das aus der Kehle dringt
Ist Lohn, der reichlich lohnt.*

Even in our dry era poets and writers of fiction write because of an inner necessity, write things they may never publish, for their own interior satisfaction, to give vent to feelings which would otherwise stifle them. This has nothing to do with asking for an apple. Of the thousands of words which even a modern man pronounces every day, the majority is spent in friendly and quite useless chat and conversation with his sweetheart, his friends, his wife, or his children.

In the third place, Bloomfield's theory does not and cannot have any support from a philosophical point of view. No philosopher ever presented such a theory, and none, I think, will ever defend it. To call it *materialistic*, as Bloomfield does (p. 33 of his book), is to distort completely the sense of the word *materialism* as it was used up to now by all philosophers, whether they were or were not materialists. Karl Marx and Antonio Labriola, to take two of the greatest thinkers of that school, never denied or doubted that man thinks, or asserted that we have to ignore man's thought to be scientific. They merely said (to put it in Labriola's words) that *ideas do not fall from heaven*, that is, that they are the product of certain social, biological, historical conditions in which man lives. To assert that B is the product and consequence of A does not mean that we deny or doubt the existence of B. On the contrary, it means that we admit that it exists. But, being materialists, those thinkers considered the human mind and ideas as an aspect of matter, an event, and never supposed, as Bloomfield claims (p. 32) "the interference of some non-physical factor, a spirit or will or mind," which "is entirely different from material things and accordingly follows some other kind of causation or perhaps none at all." This would have been entirely contrary to their doctrine of material determinism.

Or, if we turn to another great radical philosopher, who certainly cannot be suspected of any sympathy with the abhorred "idealistic" doc-

trines, nor with any "theological" prejudice, Locke, whose philosophy can be condensed in the sentence *nihil est in intellectu quod prius non fuerit in sensu*, we can see immediately that he never dreamed of denying that there is something in the *intellectus* (he even speaks frequently of "ideas"). He merely asserted that ideas are not innate, that they come to us through the senses, through experience; which is, of course, a quite different proposition. The same holds true, for example, for Hobbes, who wrote: *Nulla enim est animi conceptio quae non fuerit ante genita in aliquo sensuum* (*Leviathan*, Chapter I [*De Sensu*], edition 1670).

In conclusion, for these and other reasons, Bloomfield's "mechanistic" doctrine of language must be rejected and semantics remains a field of invaluable importance for all scholars interested in psychology and in man in general.

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SCIENTIFIC LAW IN PSYCHOLOGY, THE CONCEPT OF.—The statement that psychology has a long history but a short past (Ebbinghaus) is attested by the fact that laws in this area are as old as Aristotle, but passing centuries leave unsettled the question of the exact nature of such laws and of the domain where they are presumed to hold. The persistent difficulty in the way of establishing scientific laws in psychology is the problem of determining a specific field of phenomena within which scientific principles are to be established. The main rift lies between mentalism and behaviorism, and involves the body-mind problem in general with its various monistic and dualistic solutions. The present article will first discuss the problem of domain, to be followed by an analysis of various conceptions of psychological law (principles, functions) which follow variant solutions of the domain problem.

The Domain of Psychological Law. For modern experimental psychology the difficulty regarding the proper field for psychology dates back to the disputes between W. Wundt and F. Brentano (1874) regarding the objective or subjective status of sensations; Brentano regarding these as objective (in contrast with subjective psychical "acts"), while Wundt regarded sensory (and other phenomena) as subjective. Later, Mach, Külpe and Titchener found a compromise in terms of the view that physics and psychology start from the same world of experience; but that physics studies phenomena as independent of the observer, while psychology investigates their dependence on observation. However, accepting sensations, percepts, images, ideas, emotions, feelings, etc., as introspectible mental phenomena (Titchener) led to the difficulty of establishing quantitative laws regarding them. The sphere of sensation appeared the most promising for establishing such exactitude. However, it developed that "units" of sensation had to be stated in terms of stimulus units; and "just noticeable differences," presumably purely mental units, varied with the individual observer and from time to time with given stimulus conditions.

Since associated bodily processes are susceptible of quantitative measurement, the inevitable drift of psychology since Titchener has been toward physiology. Hence the development of radical behaviorism (J. B. Watson, A. P. Weiss) has been followed by the importation into psy-

chology of the concepts of *reflexology* and *neurology*. At present, one of the major trends in psychology is the initial acceptance of both mental and physiological phenomena as proper areas for psychology, but with the hope of establishing a monism of physiological laws in the end. Thus, Edwin G. Boring proposes a program of research designed to investigate the parallelism between mental and physical dimensions as exhaustively as possible, with the ultimate objective of replacing conscious dimensions by physical ones, achieved by establishing psycho-physical correlations so perfect that dualism would vanish. For the present, dimensions of consciousness cannot be neglected, but their reduction to categories of quality, extensity, intensity, and protensity suggest progress towards simplification. Field and dimensional concepts are used towards this end. The reduction of qualitative differences to quantitative ones appears to be the main stumbling-block to the aim in question. Whatever the neural processes associated with sensations of red and blue, they are not themselves red and blue. Quantification of the qualitative and modal differences between sensations has been sought as follows by J. P. Nafe: Evidences indicate that stimulation involves initial processes of *movement* in non-nervous tissues where end-organs are embedded, as appears quite obvious in the instances of touch, pressure, and kinaesthesia. Pain is regarded as a consequence of intensive pressure, temperature a result of vaso-motor dilation and constriction, hunger and nausea the result of movements of the digestive organs (Boring). Adaptation may be regarded as a consequence of physical equilibrium between stimuli and non-nervous tissues, while evidence indicates that affective and emotional states are pressure patterns arising from bodily movements. Initial patterns of movement generate electrical volley patterns in the nerves, which in their turn result in sensations and patterns of sensation. If it be argued that red, sweet, cold (etc.) still remain unstable as multiples of a common unit, the reply is that physical sciences too are still dominated by qualitative distinctions between their ultimate elements.

The difficulty of reducing mental to physical events is especially apparent from the point of view of *constitutive analysis*, i.e., where *identification* of mental and neural processes is attempted. The alternative view is that of a psy-

cho-physical parallelism, where the physical aspect of the parallel is favored because of its measurability. From the *causal* point of view the apparent interdependencies between the mental and the physical could more plausibly be replaced by correlations within the latter variable.

The use of operational concepts (P. W. Bridgman) are being introduced with a view of establishing an objective and univocal field for psychology (C. C. Pratt, J. A. McGeoch, S. S. Stevens, C. L. Hull, and others). In general, this point of view regards concepts, not as referring to objects (whether mental or physical) but to the operations from which the concepts were derived. Thus, the psychologist, solely occupied with his methods of research and their conceptual results is assumed to be free from ontological concerns regarding the nature of mental events *as such*. Relativism suggests that "things in themselves" in any case depend on relations sustained with other things. The relations rather than the things related become the proper matters for scientific research. When such relations are stated quantitatively they become functions or scientific laws. The efficacy of this attempted escape from ontological concerns may be questioned: The failure of a given process in nature to conform to one law is merely replaced by the failure of various operations to yield the same law.

The ideas of logical positivism (Carnap, Neurath) are also invoked as aids towards the clarification of questions of domain. By translating predicative statements into syntactical form, having to do with the *form* of the assertion and not its material *content*, there emerge a variety of syntactical languages of science; which, like operationism, are assumed to avoid metaphysical questions. It is proposed that unity be achieved among syntactical languages by regarding the language of physics as basic for all of them. The translation of psychological statements into "equipollent" physical ones is thus designed to attain an objective and verifiable psychology, as when anger is stated in terms of physiological rather than introspective data (Carnap).

Hormic and Gestalt points of view are quite opposed to the tendencies sketched above towards homogeneous domains for psychology, whether physical, physiological, methodological, or linguistic. The hormic school (McDougall,

Freud) accept both bodily and mental components of behavior and seek to find their integration in terms of teleological principles. The earlier functional school (James, Angell, Ladd) sought a similar integration in terms of the concepts of adaptation and survival. The latest development of these trends occurs in current studies of levels of aspiration and the effects on such levels by barriers, field-limiting factors, personality traits, previous experience, etc. (See *Levels of Aspiration*.)

The *Gestalt* movement, particularly under the influence of Köhler, approaches the domain problem as follows: After making an initial distinction between physical and physiological realms (both being transphenomenal and inferred) and the phenomenal world of experience, Köhler seeks to find explanations for observed connections between phenomenal experiences in terms of hidden principles of functional dependence in the physiological (neurological) realm. Between these two realms, each conceived as an organized field, principles of isomorphic resemblance are to be found—segregation, continuity, enclosedness, order, gradience.

Conceptions of Psychological Law. We have now to sketch the main conceptual forms of psychological law developed in the various views regarding the proper domain for psychology. In the material sciences laws are statements of the quantitative invariant relations (functions) which hold between two or more variables. For behavioristic systems, since subjective data are excluded, the problem is to discover what functional relations (*f*) hold between measurable stimulus (*S*) conditions and response (*R*) variables. If under given *S* conditions the *R* consequences were always the same, *f* principles of exact form could be established. In psychology this ideal simplicity is never attained even with the simplest reflexes (Sherrington). Hypothetical intervening variables are introduced to account for observed variations of *R* when the *S* conditions are fixed. In fact, certain subjective mental states of the subject may be regarded as intervening variables in this sense. The behaviorist, of course, will tend to employ intervening variables inferred from the *S* or the *R* factors. The factors thus inferred will usually be neurophysiological concepts. Failing demonstrative evidence of the existence and identity of the latter the behaviorist posits hypothetical ones (K. W.

Spence, C. C. Pratt, E. C. Tolman, and C. L. Hull). Such intervening variables serve the heuristic purpose of breaking down the intricate network of relations between S and R variables into simpler component functions. E. C. Tolman and C. L. Hull are at present the accredited spokesmen for this point of view.

Tolman recognizes two main classes of independent S factors: environmental and individual difference variables. The individual variables modify the effects of environmental variables on resultant behavior. Environmental and individual difference variables (independent) are integrated with the R variables (dependent) by a general function f_1 . However, this basic f_1 function may be established gradually by assuming hypothetical and less general intervening constructs of two types: f_2 variables which mediate between the independent variables and F_1 , and f_3 functions which hold between f_1 and the dependent variables R. These intervening constructs begin as hypotheses but are ultimately defined experimentally. Thus, in Thorndike's studies of animal learning, the law of effect is an f_2 function uniting the independent variables and the basic f_1 function of "bond formation." Tolman makes use of such variables as demand, appetite, differentiation, etc.; and considers that Lewin's topological vector concepts lead to the best understanding of the f_3 functions; which, since their operation immediately precedes R, express the joint action of earlier factors.

C. L. Hull notes that since our present knowledge of behavior is confined to relatively coarse segments of behavior, our knowledge of behavior is and will remain *molar* for some time to come, that is, will be inexact. Hence, psychology, like physics, resorts to the use of hypothetical entities to bridge regions not directly observed. Hull notes the similarity between the physicalism of the Vienna positivists and the behavioristic approach. Thus, felt anger is an objectively unobserved intervening variable between the situational causes and the attendant organic responses of anger. The modern behaviorist thus appears to use an introspected datum to identify the *kind* of process under investigation, as the physicist might use the quality red to signify the presence of light vibrations of a certain wave length. Hull's hypothetical intervening variables—habit-strength,

affrent impulse, drive intensity, reaction-potential magnitude—appear to be more objective than some of Tolman's (demand, appetite). Such terms may appear as masked labels for psychological terms, as when Hull conceives *need* in one situation as the number of hours of food deprivation. However, this term is treated as hypothetical until experimental observation has indeed shown that a definite function holds between hours of food deprivation and behavior, justifying the definition of need in terms of the former. In both the systems of Tolman and Hull the operational value of these schemata are stressed, and their use in concrete research is pursued energetically. Other psychologists (E. Brunswik, C. E. Buxton, and others) have adopted similar schemata for psychological research.

There are psychologists, however, who consider that the establishment of S-R functions does not require the use of intervening variables, not even physiological ones (H. Woodrow). The concept of "need" (in Hull's sense) appears to simplify research by confining observation to the effects on behavior of variations in the S condition of food-deprivation. The function holding between such deprivation and the number of times (behavior) an animal crosses a barrier may be investigated *directly*. To assume an intervening food-getting "need" is redundant, since such need is defined in terms of the number of crossings. Similarly, we do not need to know the neurological correlates of memory or intelligence in order to measure them in S-R terms.

In Gestalt psychology scientific laws are statements of functional relations holding between wholes: the whole subject, the whole situation, the whole response. For all three of these there are emergent whole properties (Ehrenfels qualities) not accounted for from observations of fractionated parts of them. For the Gestaltist (Wertheimer, Koffka, Köhler, Lewin) the aim of psychology is to discover principles which operate in the same way in various whole areas of phenomena; as when the principles of similarity, closure, pregnance, etc. function in the areas of perception, learning, recall, problem-solving, goal-seeking, etc. Or, taking one of these principles, research seeks to determine how it operates in some phenomenal area and in the associated neurological processes. Such principles appear to play a role in psychology sim-

ilar to that of certain principles in material sciences, as when the principle of inertia appears as an explanatory concept in all phenomena of movement, or where the concepts of attraction and repulsion are invoked in molecular chemistry. Such general principles become general laws or functions when stated quantitatively. There is a similarity of meaning and use which *Gestalt* psychology makes of such principles and the intervening variables of Tolman and Hull; except for the insistence of the Gestaltist that functions hold, not between atomic variables, but between configured wholes which are not to be fractionated beyond sub-wholes. However, the F_1 function of Tolman, when attained, would be a genuine *Gestalt* principle. The dispute between the two schools would then be a methodological one—the Gestaltist contending that an isolated S factor has different results than the same factor in a configured whole. In actual practice, since the neo-behaviorist varies one factor at a time, not when it is "alone" but when other S factors are present, the S situation may operate configurationally (dynamically) as demanded by the Gestaltist; and observation could not fail to reveal altered effects on behavior when a given S condition occurs in a new combination with others. The question which remains is whether or not the altered behavior resulting from variations in the S setting can be stated as a quantitative resultant of the S factors considered separately. The analyst in psychology tends to support the view that the general f_1 function is the quantitative resultant of simpler S-R functions; and the Gestaltist tends to deny this. Research findings alone can decide this issue: so far, both views claim experimental substantiation.

In Lewin's system an environmental field (E) interacts with an organized subject (P), and the resultant behavior (B) emerges as a whole from the E-P setting; where B, P, and E are psychologically conceived. For Köhler in particular the task of psychology is to discover hidden principles of functional dependence in the physiological sphere which correspond isomorphically with connections observed in the phenomenal sphere, where both spheres are conceived as macroscopic fields exhibiting *Gestalt* properties. These isomorphic principles are essentially principles of similarity between the two fields. Thus, when the observer sees a segregated object phenomenally, a segregated

process occurs in the visual cortex. Theoretically, as in Boring's system, the identification or perfect correlation of mental with physiological strata of reality might follow the discovery that all relationships between the two strata are isomorphic. Köhler questions the attainment of this state of affairs because isomorphic principles of phenomenal and cortical processes appear to be confined to macroscopic events (compare Hull on Molar psychology). There appears to be no way of extending principles of isomorphism (say) to colors and microscopic (chemical) processes in the visual areas.

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SOCIOMETRY.—Sociometry, as a school of thought, was started by the work of J. L. Moreno, M.D., and gained its greatest impetus through his original development of new methods of exploration and analysis useful to social scientists in any field. (His sociometric contributions should be studied in conjunction with his equally important and fruitful work in psychodrama and sociodrama.)

Sociometry is the study of the interrelation patterns existing between people. It is not concerned with official relationships but with the actual psychological components of their existing interactive relationships. It aims to uncover the psychological geography of society, the dynamic interpersonal structures which are the base for all other societal phenomena—the structure in which the latter are imbedded and

carried. It contends that to study the latter apart from their locus is futile.

Sociometry views the feeling process of attraction and repulsion between people as *tele*, dependent upon *both* individuals, even though the flow of feeling may be at an infra level from one individual, or may be incongruous, at different levels of intensity and mainly positive and/or negative from either individual. (It thus, of course, departs from the notion of affect as being an individual projection.) It discloses and emphasizes the interindividual nature of society and explicitly demonstrates the interdependence of mankind in the psychological geography of his society. It insists that a science of society must have knowledge of the actual psychological structure obtaining among its peoples and within all groups.

Consequently, from a sociometric viewpoint, the personality of a given individual must be seen in the midst of his interpersonal relationships, as the center of a *social atom* made up of his numerous tele relationships with other individuals; these other individuals in turn are seen to be linked through their social atoms with yet other persons more distant from the given individual psychologically, but through his indirect linkage with them he may exert (or receive) influence, and his "personality" be felt (or respond). The psychological roadways that cross this social atom may comprise many psychological *networks* which may have a bearing upon the milieu in which he as a person acts and is to be understood. His role in the group can be defined specifically through these sociometric data. Similarly he may be found a focal point of *cleavages* of an interpersonal sort. Such dynamic social facts are seen to be essential for study of personality. (Words in italics are sociometric terms first used by Moreno to describe the findings.)

The main instrument making for progress of sociometric knowledge has been the sociometric test devised by Moreno. His sociodrama and psychodrama, however, have illuminated many areas where exploration at deeper levels is needed. The sociometric test discloses the feelings which individuals have in regard to one another *in respect to* membership in the group in which they are at a given moment (ideally all groups in which they are members). (It is often described erroneously as a test of friendship constellations; a few sociometric tests of

friendship have been made, but only superficially; the latter are difficult to make, whereas other groupings have more definite goals and their outlines can be more readily defined.) It is an action test. Intrinsic to its validity also is the fact that it is so constructed as to enable the subject to be an active agent in his *own* behalf. (For example, a child in school is invited to choose those other schoolmates whom he wants to sit beside in the same classroom.) The criterion of the test is the nature of the group it is to serve, and accordingly it alters with the group. (For example, in work sections in factories the criterion would be the particular task involved.) In all cases the criterion for choice must have explicit meaning for the subject and offer him the specific opportunity to give information for reconstruction (or retention) of the situation in which he is. The procedure is open and the results are put into operation to the optimal satisfaction of all members of the group. There is thus brought to light the psychological position of every member and the composition of the group's structure as a whole at a particular time. By periodic testing, the changes in structure can be traced, followed, and evaluated.

The *emotional expansiveness* or *tele range* differs from individual to individual and presumably could be affected by the spontaneity of the individual, similarly as other aspects of his life are affected by this factor. In early childhood, "the s factor is an active agent in behalf of the infant long before intelligence and memory develop," but "there comes a point . . . when intelligence and memory take the lead and the s factor is forced more and more to be subservient to them." (Quoted from J. L. and F. B. Moreno, "Spontaneity Theory of Child Development," *Psychodrama Monographs*, No. 8.) This is not in conflict with the writer's finding that the individual choice expression, "his emotional repertoire," shows no significant change at an age level approaching adulthood. It may well be that the s factor by this time is itself relatively constant in its influence; at earlier age levels it may be progressively reduced as the child grows older and is himself compelled to behave in stereotyped patterns in accordance with what the culture dictates.

Sociometry discloses that the psychosocial structure of groups is directly related to the

way in which the group functions—that the conduct of individuals thrown into association with one another for whatever given end is explainable in the light of the psychosocial structure of that group (both within itself and towards other groups). It reveals that individuals generally seek to relate themselves to other individuals regardless of the response towards them made by other individuals with whom they are in contact. Moreover, attitudes exhibited in conduct are found to be related to such social relationships as the individuals have at the time they show particular attitudes.

When individuals are allowed to group themselves according to the positive and negative tele existing among them, the structure which results is not merely the genuine psychosocial structure of that community: it is the structure which represents the alignment of the members towards one another *because* of basic needs which find fulfillment through specific other members in that community. It makes apparent the actual dynamics of social change and the avenues along which it is taking place.

In such a structure the overchosen individuals cannot be described and dismissed as "popular" persons: they are not popular in any superficial sense. They are found to be the protagonists of the needs and desires of large numbers of the population—sufficiently effective protagonists to draw choice on a sociometric criterion or on several sociometric criteria. They are the members who are most wanted participants and who have earned this choice status because they act in behalf of others with a sensitivity of response which does not characterize the average individual in the community (chosen to an average extent). They are found to be individuals who see beyond the narrow circumference of their own personal needs into the wide range of needs of their fellow-citizens. They are the individuals who go farthest in relating themselves to others and in translating the needs of others into effective outlets. And when the actual psychosocial structure is allowed to find expression, the community is found to produce many varieties of leadership—varieties which represent the manifold, diverse needs of its many interacting participants. Similarly many varieties of isolation (individuals unchosen) are revealed.

Thus to implement democratic practices fully,

sociometric techniques would appear indispensable. Through their systematic use, it is premised, man could build a psychosocial structure of society which would function at the actual plane of his own ingenuity, social insight, and spontaneity—that is, a society in which there will be no cleavage between the overt manifestations of group life and the network of interpersonal relationships existing between the participants. Sociometry, as a movement, is developing rapidly in this direction. Its fields of application are closed and open communities, families, schools, churches, factories, etc.

The following quotation is representative of Moreno's statements on sociometry:

"A true therapeutic procedure cannot have less an objective than the whole of mankind. But no adequate therapy can be prescribed as long as mankind is not a unity in some fashion and as long as its organization remains unknown. . . . A number of scant proofs have been uncovered which indicate that such a unity of mankind does exist. Its organization develops and distributes itself in space according to a law of social gravity which seems to be valid for every kind of grouping irrespective of its membership. . . . These tendencies may become apparent on the surface in the relations of individuals or groups of individuals as affinities or disaffinities, as attractions and repulsions. These attractions and repulsions must be related to an index of biological, social and psychological facts, and this index must be detectable; these attractions and repulsions or their derivatives may have a near or distant effect not only upon the immediate participants in the relation, but also upon other parts of that unity which we call mankind. The relation which exists between the different parts may disclose an order of relationships as highly differentiated as any order found in the rest of the universe."¹

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¹ Quoted from page 3, J. L. Moreno's *Who Shall Survive?*

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SPEECH PATHOLOGY.—I. THE FIELD OF SPEECH PATHOLOGY. Psychologists as a professional group have often failed to appreciate the close relationship which exists between their own field and that of speech pathology. Although the majority of the membership of the American Speech Correction Association have had psychological training, and professional membership in this organization is not granted without a thoroughgoing academic and clinical preparation in psychology, there is no affiliation or close association with the various psychological groups. This misunderstanding is especially unfortunate, since the majority of problems met in speech pathology are usually diagnosed and treated through the application of methods well within the scope of clinical psychology. Speech pathology is at present oscillating between the fields of psychiatry and speech education. It may finally come to rest in clinical psychology.

Speech pathology has experienced a remarkable growth in the last fifteen years. College and university speech clinics are now offering their services in all but a few states. Special classes in corrective speech are conducted in many large school systems, and special speech correction teachers have been subsidized by some of the states to serve small towns and even rural schools. Teachers' colleges are training elementary school teachers in the recognition and prevention of the speech defects and disorders. Child guidance clinics often include a speech pathologist. Many hospital speech clinics exist in the United States, although they do not dominate the field of speech pathology as they do in England and on the continent. Private practice, usually associated with pediatrics, or otolaryngology, has also shown a steady growth. The number of charlatans in the field has decreased rapidly, due to the influence of the American Speech Correction Association and its voice, the *Journal of Speech Disorders*, abstracts of which regularly appear in the *Psychological Abstracts*. Organized programs of research are being carried out in many of the major universities, and the quality of this research is steadily improving.

As in so many other fields, a good deal of controversy exists. Agreement is fairly general so far as etiology and therapy of the articulatory (Dyslalia) and voice (Dysphonia) disorders are concerned. Stuttering (Dysphemia)

and cerebral palsy speech (Dysarthria) and aphasic speech (Dysphasia) present problems much more complex, and many different theories and therapies prevail.

The nomenclature of speech pathology, once so cluttered with Greek and Latin combinations that seven or eight unpronounceable synonyms were used to designate a particular symptom, has shown an unmistakable trend toward simplicity. For example, an articulatory case whose dyslalia manifested itself in defective *r*, *k* and *s* sounds was formerly said to possess rhotacism, kappacism and sigmatism. A monograph by Ogilvie¹ compiled the various labels and definitions and helped greatly to establish a common usage.

Classification of the speech disorders is based either on etiology or symptomatology and the latter seems to be becoming dominant, probably because categories of symptoms can be more discrete than categories of causes. When such an influence as imitation can produce several very different speech disorders, it has little classification value. At the present time both etiologic and symptomatic classifications are commonly used. *Stuttering* (Dysphemia) refers to the functional disorder characterized by abnormal hesitations, repetitions, prolongations and the associated struggle and avoidance reactions which interrupt the rhythm or fluency of speech. *Articulatory* disorders are commonly divided into *Dyslalia* (functional) and *Dysarthria* (organic). Both are characterized by sound substitutions, omissions, insertions or distortions. Lipping, lalling, baby talk, and a multitude of other terms are used to designate different patterns of defective sounds. The *voice* disorders (Dysphonia) refer to defective pitch, intensity or timbre of phonation. *Aphasic speech* (Dysphasia) designates the disorder characterized by difficulty in the perception, formulation or expression of speech.

Many speech disorders fall into several of these classifications. The speech of cleft palate, foreign accent, spastic and aphasic cases usually involve both defective articulation and phonation. Despite these difficulties, the general practice of the speech pathologist concerns itself with the speech disorders as so defined.

II. DYSLALIA (FUNCTIONAL DISORDERS)

Symptomatology. Individuals with *Dyslalia* have defective speech sounds, and their errors may be classified as substitutions (*tandy for candy*), omissions (*no for nose*), insertions (*gareen for green*), and distortions such as the slushy *s* and *z* sounds so characteristic of a lateral lisp. Approximately 79 per cent of all speech defective children have such consonantal errors, and more than one defective consonant is usually found in any given case. The patterning of these multiple errors frequently has implications for diagnosis and therapy. In *lalling*, the majority of the substitutions and distortions are often due to inactivity of the tongue tip in the production of the speech sounds. Hard of hearing children frequently confuse such cognate consonants as *f* and *o*, *k* and *g*, or *s* and *z*. The most frequently mispronounced consonants are the *s* and *z*, *d* and *f*, and the various *r* and *l* sounds. Sound substitutions are the most frequent type of error with distortions, omissions and insertions following in that order. Errors are most frequently found in the final position, and least frequently in the initial position of the word.

Since *Dyslalia* arises out of the early speech patterns of childhood and seldom appears spontaneously (except in brain injury cases or as regression phenomena in adolescent children), the etiological factors usually involve developmental retardation. Low intelligence usually reflects itself in *dyslalia*, but it is probably not a direct causal factor, since many aments attain a mental age of seven (when normal children have good speech) and still are badly dyslalic. Recent studies have shown that severe illnesses at the time children normally learn to talk, birth injuries, slow physical growth, and high-frequency deafness, are common factors in producing *dyslalia*. Environmental factors such as too much isolation, over-anticipation of the child's needs without requiring speech, unreasonable parental speech standards or demands, imitation of defective speech, parental fostering of infantile behavior, improper methods used in teaching the child to talk or in penalizing his infantile errors are all important mal-influences in *dyslalia*.

Organic abnormalities of the palate, tongue, teeth, lips and jaws as etiological factors are

¹ Ogilvie, M., "Terminology and Definitions of Speech Defects; Teachers College Contributions to Education," No. 859, 1942, 300.

treated by most recent texts in speech pathology with some caution. Backus declares, "Structural anomalies in the mouth do not always produce articulatory defects." Berry and Eisen-son say, "Too often, we believe, the cause of articulatory defects has been assigned to the oral articulatory organs." West, Kennedy, and Carr refer to a mysterious x-factor to explain why one child with a severe dental or oral abnormality will have dyslalia while another child with the same structural defect has perfect speech. Van Riper points out that feeble-minded children with organic abnormalities seldom learn to compensate for them so as to produce the speech sounds in unusual but acoustically adequate ways, but that normal children with good speech standards and instruction can do so.

Poor motor coordination is often cited as a cause of dyslalia, and recent research seems to corroborate this belief. Dyslalics are below average not only in tongue strength and movement control but in the larger motor skills. Both speed and accuracy seem to be affected. Palmer and Osborn's research is especially promising in that they found statistically significant differences in tongue strength (pressure) between normals and dyslalic speech defectives.

Another etiological factor, largely unexplored, involves perceptual deficiencies. The dyslalic case seems to lack the ability to analyze words into their component sounds, and he also finds difficulty in synthesizing or combining sounds to form new word-wholes. This factor, which seems vital to the self-correction which the dyslalic must master to overcome his speech problem, has been investigated only through auditory memory span tests, and the research has been inconclusive.

Therapy. The treatment of dyslalia varies with the severity of the disorder. Younger children with few defective speech sounds are often treated in large groups, emphasis being placed on the identification of the consonants, their acoustic features, and manner of production. Strong stimulation and the analysis of word-wholes into their sequential components (vocal phonics) are employed. Errors are made vivid, yet penalty is avoided. Public school systems which have instituted such programs of speech improvement in the elementary grades produce few adult dyslalics.

Therapy for older or more severe dyslalia

cases often requires much more than this simple teaching of new speech sounds. Attitudes of shame and embarrassment, retreat reactions which affect the entire personality, compulsive plunging into unnecessary errors, transitory auditory amnesias, all these problems and many others tax the clinician's ingenuity to the utmost. Not only must new sounds be taught but old ones untaught. Words are configurations, melody wholes, and when a sound lasting one-thirtieth of a second is the only defective feature, some difficulty is experienced in replacing it.

Upon a background of consonant identification and word analysis, the speech pathologist usually concentrates his therapy on a single defective consonant. Auditory perception of the differences between the correct and incorrect sounds is stressed. Powerful stimulation with the isolated sound is given until it temporarily dominates the dyslalic's consciousness. Then the isolated correct sound is taught. Several methods are used: the modification of known sounds, auditory stimulation, phonetic placement of the articulatory organs, and the moto-kinesthetic method. The newly acquired sound is then strengthened through simultaneous talking and writing procedures, or the use of rhythms or melodies, until it is being produced correctly and automatically in isolation and in nonsense syllables. Then, through reconfiguration devices and other techniques involving preparatory sets released by a sudden signal, the newly acquired sound is incorporated into familiar words. After these are mastered under conditions of speed, or emotional excitement, the therapy proceeds to the habituation of the new sound. Negative practice (Dunlap's Beta hypothesis), the use of nucleus situations in which errors are checked or self-penalized, and the cancellation of failures are used in this habituation.³ Drill is minimized in modern speech pathology and the new sound is incorporated into meaningful communicative social situations as quickly as possible.

III. STUTTERING (STAMMERING)

Symptomatology. When stuttering begins, usually at the pre-school age, the symptoms consist primarily of automatic effortless repeti-

³ See texts by West, Kennedy, and Carr, Backus, Nemoy, and Davis, Van Riper, Froeschels, and Berry, and Eisen-son, for details of therapy.

tions of syllables or equally easy prolongations of the initial sounds of words. These, the primary symptoms, occur usually at the beginning of communication and under conditions of communicative stress. The child seems unaware of these breaks in his fluency at this stage. If they become unpleasant through their frustrating of important communication or if the child's associates penalize them or bring them to his awareness, he begins to react to them by struggle or avoidance. Fears of words, sounds, or speech situations develop, and pronounced anxiety states occur. The child adopts tricks and devices to avoid, postpone or time the speech attempt, and these become ritualistic habits of approach to the feared words. The struggle to release himself from the automatic clonic repetitions or tonic prolongations results in hard contacts of the lips, tongue-teeth, tongue-palate, or ventricular folds. These contacts are accompanied by force so great as to precipitate tremors of the organs involved. Since they interrupt the air stream necessary for speech, much of the struggle involves the breathing apparatus which commonly demonstrates (in this secondary stage of stuttering) pronounced anomalies. When all these reactions are supplemented by interruptor devices, retrials, and disguise reactions, the total abnormality becomes bizarre indeed. Severe stutterers are penalized socially, academically and economically, and profound personality deviations are frequently found. According to most researches, one per cent of the school population stutters, and the frequency does not decrease with age. More males than females stutter and the ratio is approximately six to one.

Etiology. Most of the research on the etiology of stuttering has been indecisive, probably because of the theoretical bias of the investigators, and there are almost as many theories concerning the nature and etiology of stuttering as there are stutterers. No single cause of dysphemia is known. Instead, there seem to be certain predisposing factors such as stuttering heredity, birth injuries, severe fevers during the speech-learning period, physical and emotional trauma, a shift of handedness, emotional conflicts manifested through excessively critical or anxious parental attitudes focussed on the normal hesitations which most children show. The precipitating causes are of infinite variety but they usually reflect some type of emotional

conflict centering on speech. Organic abnormalities of the speech organs have no direct bearing on etiology.

Therapy. Beginning or primary stuttering is treated by the majority of speech pathologists in the same fashion. The disturbing environmental influences are identified and removed. Frustration is avoided and penalties are discarded. Since primary stuttering usually comes in waves, the good periods are used to foster much speech, and the bad days are arranged so as to entail a minimum of communication. The child's security is enhanced in every possible way. Excitement and emotionality are minimized. Periods of speech play are instituted and these consist of speaking in unison, of rhythmic sentences, under conditions of relaxation, of echo speech, of combining speech with large trunk and limb movements. The parents are instructed to speak to the child more slowly, rhythmically and simply, and less frequently. Interruptions, speech competition, demands for speech exhibitionism, the confession of hurt or guilt are avoided. In short, environmental influences leading to speech hesitancy are removed, and a new regime which fosters fluency is instituted. The primary stuttering symptoms are not treated directly.

Treatment of the secondary type of stuttering (that marked by avoidance and struggle reactions and habits, by fears of words and situations) varies with the speech pathologist and the individual with whom he is working. An excellent historical study of the methods used in treating dysphemia is that by Klingbell, and Hahn has surveyed present-day therapies. Hypnosis has been used successfully in exploring past conflicts, but extensive experiments in post-hypnotic suggestion have shown only temporary results. Psychoanalysis has effected some "cures," but all therapeutic regimes have had occasional success. Two major types of therapies, both symptomatic, are prevalent. In the first, relaxation, suggestion, and distraction are used to prevent the occurrence of stuttering. The case is convinced that he can talk without "blocking," and his confidence is built up by proceeding from easy to difficult situations until fluent speech is achieved. In the second type of therapy, the stutterer is encouraged to stutter but to vary the type of symptoms until he has learned to stutter with a minimum of effort, interruption or abnormality. The advantage of

this type of therapy, according to its exponents, is that it fosters better mental hygiene and prevents relapse. Feared words and situations are faced directly. Avoidance and disguise reactions, which precipitate relapse, are unnecessary when the stutterer can control his speech disorder to such a degree that society will not notice or penalize it.

Both of these major types of therapy are supplemented by other techniques aimed at building up the stutterer's security and solving his conflicts. Most speech pathologists also employ other supplementary methods such as breathing rituals, rate control, simultaneous talking and writing, and rhythmic timing, which reflect their theoretical bias. Therapy based on etiology alone has seldom been successful, since stuttering has a perseverative character which provides its own precipitating factors. The problem is very complex, and although excellent results are reported by many clinicians, no one method for treating this disorder has found general acceptance.

IV. VOICE DISORDERS (DYSPHONIA)

Symptomatology. Dysphonia may involve pitch, intensity or timbre, either separately or in combination. Thus the *false* voice is not only abnormally high in pitch, but it also possesses a characteristically peculiar quality. A monotone, speaking at the lowest note of his pitch range, may also have so weak a voice as to interfere with communication and may call attention to itself. On the other hand, a *denasal* (adenoidal) voice may demonstrate no abnormality of pitch or intensity. The dysphonias most frequently treated by the speech pathologist are *aphonia* (loss of voice), *rhinolalia* (excessively nasal or denasal speech), *false* voice or too highly pitched voices, *monotones*, *hoarseness*, and *guttural* voices. *Cleft palate speech*, which presents a common problem to every speech pathologist, consists of a voice defect (excessive nasality) and an articulatory defect, since most of these cases not only emit the consonants through the nose, but also demonstrate many sound substitutions, omissions and distortions. Therapy for cleft palate speech (*uranischolalia*) uses techniques taken from both the fields of dysphonia and dyslalia, and in addition, special rehabilitation in strengthening the palate and directing the phonated air stream through the oral port is stressed.

Etiology. The causes of dysphonia are both organic and functional. Nodules on the vocal cords, inflammation of the membranes, diseases such as tuberculosis or laryngitis, cancer, injury to the nerves controlling the larynx or palate, and many other organic causes can be cited. Poor hearing frequently results in compensatory disorders of intensity, pitch or quality. Interrupted or abnormal sexual development often reflects itself in defective phonation. Despite all these factors, the majority of voice defects are probably of functional origin. Overstrain and abuse of the voice, imitation, poor training and emotional conflicts are the common causes of dysphonia.

Therapy. The treatment of voice disorders consists primarily of removing the etiological factors involved. Treatment of the symptoms is often necessary since habits of defective phonation may persist long after the original cause has ceased to exist, but voice retraining alone is seldom satisfactory. Hysterical aphonia or the nonexpressive monotonous voice are often treated entirely through placebos, suggestive shock, hypnosis, or similar psychiatric techniques. Strained, strident and false voices have often responded to relaxation techniques or to mental hygiene.

In other cases, careful retraining is necessary. Since the habitual pitch levels of these cases are often far out of line with their optimal pitch level rehabilitation involves ear training, devices to raise or lower the pitch such as stroboscopy, and habituation. Breathing retraining is often useful in establishing new habits of phonation. The vowels are usually the vehicle for this therapy, and the worst vowel is often used as a nucleus for retraining. Reading or memorized passages are worked over through the use of pre-scored material until adequate voice is achieved. Then through the use of nucleus situations or rehearsal, the new voice is gradually brought into daily communication. Often a certain phrase, or humming, or vocalized throat clearing is used to precede speech attempt, so that the case may "find" the new voice and key his conversation to it.

Other disorders which are frequently treated by speech pathologists are those of foreign accent with its peculiar melody, stress and inflection patterns. As in cleft palate speech, articulatory reeducation is also necessary. Occasional cases of *ventricular* (false vocal cord) phona-

tion, or *diphthongia* (two-toned phonation) are treated, and laryngectomized patients are taught to use the artificial larynx or esophageal speech.

V. APHASIS (DYSPHASIA)

Symptomatology. Aphasia represents an extreme degree of the difficulty in symbolic formulation and expression which characterizes dysphasia. Aphasics frequently manifest aphonia and articulation difficulties but their greatest problem is in comprehending, formulating and expressing meaningful material. Reading, writing and speech are commonly affected, but disturbances are also found in such representative activities as telling time and perceiving the functions of tools. Essentially, aphasia is a syndrome, a symptom complex, and the symptomatology varies so greatly from patient to patient as to make analysis and classification very difficult. Pronounced behavioral changes occur. The aphasic is often addicted to periods of weeping or rage, and irritability is excessive. Amnesia for names of objects, qualities, conditions or relationships is common. Apraxia and agnosia frequently make the clinician's task more difficult. Aphasics show marked perseveration both in speech and other language functions, repeating the same nonsense syllable or writing the same word over and over again. They occasionally show no understanding of their linguistic errors and become enraged when their auditors show no comprehension of their mutilated jargon. Their auditory memory span is markedly decreased.

The terminology used in reference to aphasia is difficult and confused, but the classification of Weisenberg and McBride seems to be finding wide acceptance in the field. They classify the dysphasias into four categories: the *predominantly expressive*, the *predominantly receptive*, the *expressive-receptive*, and the *amnesic* types.

Etiology. While some hysteric cases of dysphasia have been reported, the vast majority of them result from injury to the brain cortex, usually in the hemisphere on the side opposite the dominant hand. Efforts to localize the different types of aphasia in terms of trauma to specific areas of the cortex have not been entirely successful. The greater the injury, the more complex the symptomatology. Infectious diseases such as syphilis, encephalitis, or meningitis, and vascular disturbances resulting from

hemorrhages, thromboses or embolisms are common causes of the cortical damage. Many soldiers suffer head wounds which produce dysphasia, and tumors present another common cause.

Therapy. While no one can predict the prognosis for speech rehabilitation of aphasics with certainty, many of them have shown remarkable recovery when exposed to speech therapy. Some of the improvement may be due to amelioration of the psychological trauma present when the case was first seen; and some may be due to the development of other cortical areas (e.g., those in the opposite hemisphere) or fibers as functional units subserving the language processes. Some recovery occurs as the result of medical and surgical treatment. The speech pathologist feels that his function is to facilitate all of these by providing a systematic program of language recovery.

In retraining the aphasic many techniques are employed. A shift of handedness is often instituted, with manual activities being practiced in conjunction with vocalization. Training in articulation is often necessary to show the patient the repertoire of speech sounds he has lost, and to train him to use his speech muscles voluntarily. Imitation through mirror-work and even manipulation of the organs of speech is necessary. In one case the blowing of cigarette smoke was the only way in which the voiceless consonants could be taught. It is also necessary to teach some inhibition, not only of the wild emotional states which interrupt therapy, but also of the echolalia which hampers the acquisition of new vocabulary. Objects or activities which had special significance are used to evoke new words and the symbolic representation is reviewed frequently in order to fix this. Pictures or printed material are of far less value. Once a word is acquired it must be used in as many meaningful situations as possible. Rhythmic activities, pantomime and gestures are taught and combined with speech. With the receptive types of aphasia, it is necessary to proceed in the same way as we would with deaf children learning to speak. Associations must be built up between tactual, visual, and kinesthetic experiences and the auditory presentation of a word. Lip reading and even Braille material is used to open the doors to the patient's comprehension.

Motivation is of extreme importance, and the

periods of treatment should be short, interesting and end with success. The mental hygiene of the patient always needs careful attention. Since the clinician-patient relationship is always close, it is necessary to wean the latter psychologically before the association is terminated. This is especially important since many aphasics finally will learn to speak well when the clinician is present but at no other time. Increasing audiences and delegation of therapy often help to solve this problem.

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SYSTEMATIC PSYCHOLOGY.—There are two aspects of modern science which may be called systematic. The first of these is methodological and is concerned with the ways in which the empirical and theoretical aspects

of science are integrated in the development of scientific bodies of knowledge. The second use of systematic is to refer to the range of phenomena covered. In this way, systematic refers to the comprehensiveness of the science. Thus physics, which is the systematic science par excellence, proceeds methodologically by subjecting highly developed theoretical postulates to the test of critical experiment. Its systematic hierarchy of theories comprehensively covers almost the whole range of physical phenomena. From the application of higher mathematics to physical theory we may deduce the actual physical behavior in a wide variety of fields which appear phenomenally quite different. For many years there has been no serious controversy concerning the general outline of physical method and with the application of this systematic method, the frontiers of our knowledge of physical phenomena have been gradually increased.

Until very recently, psychology has been a somewhat heterogeneous mass of schools or systems rather than being systematic. The individual system in psychology usually was the working out of one man's or some group of men's particular methodological bias and applying this to a more or less limited range of behavioral phenomena. These schools or systems varied in regard to what was the proper scientific method for psychological investigation, in their basic postulates, and in regard to the particular problems to which they were applicable. Thus there was no real agreement concerning either the method of psychology or the nature of its subject matter until fairly recently. Even twenty-five years ago, the difference between the adherents of Titchenarian structuralism and the emerging Gestalt psychology of Wertheimer was so great that the naive student would scarcely be able to recognize that they were concerned with the same science. Similarly, the original Watsonian behaviorism and Freudian psychoanalysis were also not only in great disagreement with each other, but with the other two schools already mentioned. It is quite natural that in the early days of any science such a variety of theories and methods and such varying opinions concerning subject matter should arise. Psychology, covering as it does the whole gamut of total behavioral reactions of the personality, is a very broad field and many of its problems may be stated in such

a way that the outcome of their investigation depends on the original basic postulates of the investigator.

Today, however, the leading adherents of all of the schools have come to considerable agreement concerning both the method and the subject matter of psychology. In fact, the contemporary behaviorists have been forced to deal with problems of motivation and the unconscious and so have had to take cognizance of the factors which the psychoanalysts had previously looked on as their particular subject matter. Similarly, the Gestalt psychologists and the psychoanalysts have been forced to deal with their subject matters with that greater rigor of scientific methodology which was the chief positive contribution of the behavioristic revolt against traditional introspective psychology. Thus Lewin, a leading exponent of Gestalt psychology, writes that he believes psychology is now in a position to go beyond the schools through the development of basic agreement on what constitutes methodology. Hull, an equally outstanding theorist of modern behaviorism, attempts in his most recent writings to set up basic postulates of behavior, which will form the cornerstones of all of the behavioral sciences. And finally, there has been a growing tendency amongst psychoanalysts to subject their doctrines to critical examination in light of their scientific adequacy and thus make psychoanalysis simply a part and a method of general psychology. Despite this contemporary striving towards a systematic psychology, both with regard to its methodology and comprehensiveness, there still remain some differences regarding what constitutes a basic philosophy of biology for psychology, the nature of the scientific method as applied to psychology, and the nature of the language of science between the adherents of some of the traditional psychological systems. The following paragraphs will give both the general points of agreement and the points where further clarification is necessary with regard to the method and subject matter of psychology as these are viewed by the leading contemporary behaviorists, Gestalt psychologists and psychoanalysts. Particular reference will be made to the present positions of Professor Clark Hull as an exponent of modern behaviorism, Professor Kurt Lewin as an exponent of the most important methodological developments stemming from Gestalt psychol-

ogy, and the position of the orthodox Freudian psychoanalysts.

To a certain extent the method chosen for scientific investigation in any field must stem from philosophy. Philosophy, as the mother of all the sciences and the source of undifferentiated knowledge within the sciences, is bound to influence the individual investigator, be he conscious of this or not. Throughout the 19th and early 20th centuries, there was a great deal of debate concerning the general nature of biological phenomena, particularly the position of man in nature. Before systematic psychology as we know it today could develop, the philosophical antithesis between vitalism and mechanism had to be resolved. This antithesis—as is so often the case in the development of philosophical thought—could not be resolved through the choice of either of these, but rather through their synthesis into the new doctrine of organismic theory. Vitalism, which regarded man as a machine plus some sort of organizing principle such as the *elán vital*, the *entelechy*, or soul, was opposed by mechanism which regarded man simply as a machine. The vitalistic approach gained few serious adherents because it was early realized that the postulated organizing force was not subject to scientific verification and consequently represented a scientifically meaningless postulate. Atomisticmechanism supposed that biological phenomena must be reduced to physics, whereas vitalism believed that biology could not be reduced to physics. Both of these philosophies of biology, however, lead to an analysis which was primarily structural. The mechanistic position which seemed almost unavoidable so long as physics depended on mechanics rather than modern dynamics, ran into difficulties in attempting to account for the organization of the parts into the whole organism. Machines require engineers and, while vitalism met this problem with the postulated unobservable causal force, mechanism was simply unable to meet it. With the development of modern dynamic field-theories of physical behavior, it became possible to look on biological phenomena as organismic in nature, as organized systems of energy in which the organism in its organizational aspects represented a more or less subcontained system roughly analogous to certain physical closed systems or fields. This led to the possibility of stressing functional rather than structural analysis and

to the proposition that biological phenomena were not necessarily deductible from physics, but rather that both physics and biology followed the same sort of general logical dynamical propositions. Thus today, systematic psychology is more and more based on the organismic philosophy of biology which supposes that the organism represents a system of energy rather than a machine, where analysis of a functional or relational nature is indicated and where dynamic theory plays the same type of role which it does in physics. Certainly all serious attempts at modern systematic psychology are based on an explicit or implicit acceptance of the organismic philosophy of biology. This has important implications for both the method and the subject matter of biological science. Psychology investigates the total or integrated behavior of the psychological organism in all of its ramifications and it does so by using a dynamic methodology.

As until recently there was much debate between the adherents of various underlying philosophies of biology with regard to the method and subject matter, so there was also a considerable difference of opinion regarding the basic investigational method in psychology. Natural sciences were usually considered to be empirical and inductive as opposed to the philosophical sciences which were largely based on deductions. Psychology, as a growing natural science, tended more and more to depend on the experimental or other observational gathering of data without reference to specific theoretical constructs. Just as the mechanists were opposed to the vitalists regarding the philosophy of biology, so the inductivists were opposed to the deductivists concerning how, in practice, psychology should go about gathering its data. The inductivists believed that measurement and observation would lead to laws which were the expression of correlations between events and which could be summarized in theories if necessary. Conventional deduction was considered as the inversion of induction without the experimental procedures. This antithesis regarding method was again resolved by the synthesis of both positions into what has been called the hypothetical-deductive method, which supposes that the empirical and theoretical aspects of science are quite inseparable. According to this view, the growth of science occurs when a "hunch" gives rise to working hypotheses

which may be verified in experiment and which in turn will lead to new hypotheses of a more general nature. From the very first, theoretical constructions are utilized, not only to order and explain the empirical findings within the science, but to lead to the empirical substantiation of predictions, which may not be made on the basis of common sense experience, and so to broaden the breadth and the validity of the first postulates. Modern systematic psychology has become very sophisticated with regard to the use of theory. Thus the original behaviorists, who believed that they were creating a purely empirical objective science of behavior have given rise to the modern behavioristic psychology as exemplified by Hull, which purposely uses theoretical constructs of a very sophisticated sort in the nature of intervening concepts. The original Gestalt psychologists have been forced to introduce more and more mathematically defined explanatory constructs of a field-theoretical sort and psychoanalysis has greatly increased the number and complexity of its theoretical constructs. The theoretical as opposed to the empirical part of a systematic science consists of hypotheses of a generalized nature; laws, which are expressions of the application of theoretical constructs to limited systems; and the system itself, which refers to the largest generalization of empirical data. The explanatory process in natural science supposes that a natural event is to be explained from a theorem or set of postulates derived by the deductive process of reasoning. Natural science more and more resembles the type of logical hierarchy which is found in its purest form in geometry and in its most important applied form in theoretical physics. The hypothetical-deductive method is a method through which the descriptions of behavior in ordinary language are translated into the theoretical constructs of the system. Constructs are abstractions which give us schematic interpretations to account for the essential descriptions of experiments and behavioral observations may also be called descriptions in terms of genotypes. A genotype is a description in terms of the language of the theoretical constructs used in the hypothetical-deductive method. Thus, as psychology becomes systematized through the use of the hypothetical-deductive method, constructs play an ever larger role. This is true in modern behaviorism which makes increasing use of inter-

vening variables, such as habit strength, reaction potential, reactive inhibition, and oscillation; in Gestalt psychology, which makes increasing use of conceptions like vector, region differentiation in the personality, levels of reality and aspiration; and psychoanalysis with its conceptions of basic libidinal and destructive urges, the conscious and unconscious, and ego, superego, and id. With the introduction of theoretical explanatory constructs comes the tendency to attempt a greater precision in their definition and a greater logical stringency in their derivation and interrelationships. This leads to the attempt to mathematicize concepts because the applications of algebra and geometry to concepts makes it easy to get the universal consent of competent observers to these, which is the aim of all science. Thus at the present time, there is rather general agreement that systematic psychology must be hypothetical-deductive in its methodology and although various investigators still use constructs which are not completely intertranslatable, there is still a much greater possibility of agreement concerning the meaning of concepts than was previously possible.

With the general agreement on the organismic philosophy of biology and the importance of the hypothetical-deductive method, the type of theory accepted by systematic psychologists again becomes very similar in the leading schools. The approach to behavioral problems becomes more what has been called field-theoretical. The field concept in biological science is taken over as a general analogy to the field concept as used in physics in the gravitational and electro-magnetic fields. In any field, the behavior of an object is determined by the structure of the field rather than inherent forces within the object itself. A field represents an organized system of energy in which the distribution of forces within the field depends on the pattern or arrangement of the field rather than on the simple sum total of the parts. Forces within the field show the properties of vectors—that is directed magnitudes whose direction or amount is determined by the total distribution of energy. In field theories, events are never locally determined but are determined in terms of the functional interrelationship between the objects which make up the field. Field theories allow no dichotomies as between the abnormal and the normal, for instance. Thus modern systematic psychology tends to

become more field-theoretical and there is a general agreement that psychology is the science of the behavioral adaptation of the individual organism in its total surrounding environment.

Thus from the standpoint of method, modern psychology may be called systematic. It advances by subjecting constructed theories to the test of critical experiment. The adequacy of the constructed theory to account for a comprehensive variety of behavioral phenomena and the stringencies of the definition and the logical interrelatedness of the explanatory constructs both vary in the hands of different expositors. Of all of the contemporary positions that of modern behaviorism, as represented by Hull for instance, is most systematic in the care with which the intervening variables or constructs have been defined and related to each other. On the other hand, the behaviorists' system at present can deal only with very limited and somewhat artificial situations concerning the modification and the integration of very simple responses to very limited stimulating situations. The field-theoretical or topological approach of Lewin is based on concepts which are methodologically quite similar to those of Hull, but which are not as precisely and operationally defined. Concepts like the psychological field with its variations of person structures, reality level, and vector, barrier, and goal, cannot be subjected to the exact algebraic mathematical treatment which Hull is able to give habit strength, reaction potential, reactive inhibition and oscillation. They are, however, applicable to a much wider field of adaptive behavior in terms of human psychology than are those of Hull. The constructs of the psychoanalyst, such as libido, ego, id and superego, are logically and definitionally perhaps less adequate than either of the above. They are applicable, however, to the most complex of human adaptation problems through the whole range of both abnormal and normal mental phenomena. With regard to method, we may finally say that there is an encouraging general agreement concerning method amongst modern psychologists which allows us to assert that the systematic position of psychology has increased with increased rapidity in the last twenty-five years.

Modern psychology has also increased in its systematic aspect with regard to the comprehensiveness of the range of phenomena cov-

cred. If physical laws are gradually enlarged to account for physical happenings throughout the whole physical universe, psychological laws and theories likewise have become increasingly generalized. This has largely been due to the application of the hypothetical-deductive method and the introduction of genotypical explanatory concepts. Such genotypical concepts allow, as we have seen, no dichotomies. The original academic scientific psychology of Wundt and his followers was concerned chiefly with the structural aspects of the normal adult human mind. Modern systematic psychology goes beyond this to develop general principles which will apply to the abnormal as well as the normal, the child as well as the adult, and the animal as well as the human, and it has increased its interest from the simple structural or descriptive analysis of consciousness to an attempt at functional analysis of all behaviors, both conscious and unconscious.

This has come about through the application of the organismic philosophy of biology and the wider use and understanding of the hypothetical-deductive method. It has also been facilitated by an increasing interest in the problem of motivation which recently, after long being one of the peripheral or borderline problems of psychological research, has become essential to psychological research in its systematic aspects. Earlier theories of both the structural and behaviorists' schools were but little concerned with motivation. Practically all modern theories now accept it as a starting point. Thus the dynamic aspects of behavior tend to become stressed rather than the structural aspects of behavior. Although no theories of motivation at present will completely account for all behavior, there is an increasing agreement that motivational factors must be postulated and they become essential to modern behaviorism, modern Gestalt psychology and psychoanalysis. The interest in motivation itself has probably been the chief and necessitating reason for the invention of theoretical constructs. Thus the behaviorists are more and more concerned with drive and its experiential modification and are less and less able to attempt to account for behavior simply by accepting an irreducible minimum number of innate behavior patterns and attempting to add these together in a truly summative factor to account for complex behaviors. More and more behaviorists are con-

cerned with drive, its frustration and the resulting effects of frustration of the drive. The field-theoretical approach from the standpoint of Gestalt psychology has stressed internal psychological tension and the blocked goal situation from the very first. Motivational problems, thus, also play a large role in the modern field theories. Finally, of course, motivational problems are essential to systematic psychoanalysis.

With motivation as the central problem of systematic psychology, the other problems derive from it and enlarge upon it in a more systematic fashion. Thus all of the investigators in modern times have been interested in the problem of the effect of frustration of motivated behavior upon the individual in both its long time and short time aspects. Undoubtedly, of all the approaches here, psychoanalysis has been the most systematic in working out all of the ramifications of this problem. From the central concept of motivation, we develop interest in the problems of resultant personality structure and this leads into the field of individual differences which in turn leads into the whole field of applied psychology.

The relation of psychology to the other sciences depends on the basis on which psychology is systematized. Insofar as we today accept the hypothetical-deductive method, psychology takes its place amongst the systematized and general basis sciences. It becomes foundational to all of the social sciences on the one hand and it becomes the culmination point of all of the biological sciences on the other hand. Depending on whether the constructs are derived with reference more to physiological problems or to social problems, systematic psychology becomes more physiological or social in its basic principles respectively. Of the three chief types of systematic psychology herewith discussed, modern behaviorism in the nature of the problems studied and in its experimental methods is most closely related to physiology, whereas psychoanalysis with its emphasis on interpersonal relations is most closely related to the social sciences. Modern Gestalt psychology falls some place between the two. Since physiological methods of investigation allow a more stringent experimental control, the methodological advantages of modern behaviorism are quite obvious. The present tendency, however, is for modern behaviorism to attempt to give its exactitude and precision to problems which are

more social and hence more vital, whereas the tendency of psychoanalysis (particularly since the development of psycho-somatic medicine) has been towards the greater precision in its observational methods and the correlation of its theoretical constructs with physiological findings. Thus there is every evidence that within the next period of psychological development, the subject matter of psychology will become as systematized as we have now found its methods to be.

In summary, psychology as a science is growing beyond the schools and personal systems and is becoming systematized along the same line as physics and the older sciences. Systematic science uses a common method—the hypothetical-deductive method—and we have seen that there is general agreement on this in all modern positions in psychology. Systematized science further tends to be comprehensive with regard to the range of its subject matter. Contemporary psychology moves along these lines as the problem of motivation has become central. Although there continues to be a greater interest in some of the problems which range into the social amongst psychoanalysts and a greater interest in the problems which range into the physiological amongst behaviorists, the present at-

tempts of behaviorists to deal more and more with social problems and of psychoanalysts to deal more and more with physiological problems should bring about an increased agreement concerning this second systematic aspect of psychology. At the same time, modern Gestalt psychology with its field-theoretical approach has logical and experimental implications for physiological problems on the one hand and for social problems on the other seems destined to take an intermediating position between the other two approaches. Thus in final analysis, psychology is becoming systematic in both its methodology and comprehensiveness.

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W

WAR AND PEACE.—Clausewitz, the famous military theorist, wrote that "War is nothing but a continuation of political intercourse with a mixture of other means." Actually, war and peace can only be understood in relation to each other, just as "heat" and "cold," instead of being antithetical phenomena, come to be understood as different manifestations of molecular motion. The basic patterns of human interaction are continuous; the specific form of violence called war is an expression of trends clearly observable during peace.

Further, war and peace co-exist simultaneously. At the time when men of one nation are warring against those of another, the relations of men within each nation are peaceful. When one class or political sect wars against another, the relationships within each group are usually peaceful and cooperative in character—perhaps even more so than in the absence of external war.

War is a manifestation of organized aggression. It is not, however, directly comparable to the expression of aggressive impulses in fighting between individuals. Individual fighting implies at least some awareness of the preceding circumstances and goals sought; for most of the combatants, war includes no such awareness. Nevertheless, the ultimate explanation of war must be based on the same aggressivity which is released in fighting.

Psychologists of the nineteenth century were attached to the concept of a "pugnacious instinct" and attributed wars to this dynamic force (McDougall, 4). Orthodox Freudians accept an analogous concept of a "death instinct" (Menninger, 5). These theories have sometimes been misinterpreted as implying that war is inevitable because of human nature. Neither conception is necessarily related to such a view. Aggression, even if instinctive, could be channeled into other paths than war. In 1932 Fletcher queried several hundred American psychologists, many of whom believed in one or the other of these theories, regarding the notion

that human nature made war inevitable. Well over 90 per cent rejected this idea.

Under conditions of peace, men inhibit overt expressions of hostility (under pressure of law and custom). Competition takes economic and political forms, both within the nation and between nations. When war is declared, the taboo on violence is lifted as regards citizens of the enemy nation; in fact, such violence is socially ordered and approved.

In attempting to analyze the change from a peace pattern to a war pattern, we must differentiate among individuals. The actions of a small group may be far more potent in restructuring the situation than the contrary actions of a much larger group. The decisions that shaped Japan's course toward domination of East Asia, or of Germany toward *Lebensraum*, were made by a small minority in each case. We must distinguish, therefore, between the psychology of leaders and of followers in the transition from peace to war.

Leaders are, by definition, persons who have privileged position in terms of wealth, power, or both. To expand such holdings may be the primary goal in their acts (Japanese monopolistic enterprises in Manchuria, Nazi preferential trade agreements in the Balkans and in South America). The decision to resort to force for the sake of gaining such economic goals, or for the sake of holding such possessions against seizure, or for the sake of achieving greater power, may thus be considered a relatively rational motivation, in so far as the welfare of the leader is concerned.

This quest for power and privilege takes place initially on a peaceful basis. Competitive business and diplomatic practices precede all armed conflicts. When these fail to reach a culmination reasonably satisfactory to all concerned, the resort to war becomes imminent.

Modern war requires the active support of the majority of the followers, and passive acceptance by all but a small minority. This state is achieved by virtue of a number of pre-conditions.

tions which are present in almost all modern societies: (1) a substantial residue of repressed aggression within every individual, which can be directed into belligerent channels; (2) a distorted perception of the people who live in other nations or other social groups; (3) an identification with and feeling of loyalty to the social group and its leaders, and a need to feel secure in this relationship; and (4) a desire for vicarious satisfaction of such impulses as the power drive, through exaltation of the group with which the individual is identified.

War occurs because of the conditions of peace. A majority of American psychologists appear to reject the notion of an instinct of pugnacity, replacing it by the view that aggressive impulses are an outcome of frustration. A certain amount of frustration is inevitable in the process of becoming socialized; far more than this minimum of frustration is encountered by the average person. Poor living standards, a lack of prestige, insecurity are some of these frustrations. The average citizen thus has a great potential reservoir of hostility which cannot be openly vented because of the taboo on violence within the social group.

Such aggression often is not directed to its real cause: economic conditions, social organization, or direct physical deprivation. It may, instead, be displaced onto foreigners, Negroes, Jews, Communists or some other irrelevant scapegoat group. If leaders, through speeches, newspaper articles or other media, spread the view that "our group" is menaced by an out-group, this repressed aggressivity may be channeled into conscious belligerence directed against the menacing group as defined.

The importance of increased frustrations in making this possible can well be demonstrated by the development of the Nazi Party. Founded in 1920, the Party in 1928 was polling less than 5 per cent of the vote in German elections, and claimed about 100,000 members. By 1930 the membership had jumped to nearly 400,000 and by 1932 skyrocketed to about 1,000,000. The vote showed a similar sharp rise, to 40 per cent of the total cast.

During this interval there was no change in the character of the Party, as regards leadership or propaganda. The same "menaces" were dangled before the German people; Russia, Communism, England, France, Jews. The crucial difference between 1928 and 1932 was in

the economic welfare of the population. In the latter year depression and hardship had resulted in greatly increased suffering and frustration, with a consequent magnification of the amount of aggression ready to be displaced against these alleged enemies. The result was, if not a popular majority for Hitler's belligerent program, at least a very large block of support for it. Under conditions of severe economic deprivation, we can anticipate that similar leadership would be accepted by citizens of other nations.

The displacement process has been demonstrated in so many clinical, statistical and experimental studies that it is no longer a matter of controversy. Considerable doubt remains as to the elasticity of the process: the extent to which any group X may become an object of collective antagonism by the process sketched. The limits are probably set by perceptual patterns which have been determined by early experiences, education, etc. Considerable flexibility is indicated by the fact that Japan and Italy fought with the Allies against Germany in World War I; that England and France were "hereditary enemies" for centuries; that the Prussians were praised highly by British newspapers during and after the Napoleonic campaigns, etc.

The perceptual process itself is of course not independent of motivational determination. The maxim that "we see what we want to see" is still true. We can, however, identify independent environmental factors which facilitate this change from perceiving neighbors as friends and customers to perceiving them as enemies and barbarians.

Stereotypes. As the child matures, he acquires from his culture not only certain habits of behavior, but also certain pre-formed pictures. The American child assimilates stereotypes of Negroes, Jews, Frenchmen, Russians, etc., with predictable regularity. This mental picture, which is surprisingly impervious to the effects of actual personal experiences, determines the child's expectancies and interpretations with regard to the behavior of these outside groups. Thus, a lynching by Southern whites is interpreted as normal behavior toward a Negro, whereas less brutal behavior by Russians may seem more heinous, because of the stereotyped picture of Russians. Face-slapping by an American girl is amusing; by a Japanese, it is an "atrocious" (The learning function in-

volved in this process has been well analyzed by May, 3.)

Our acts and attitudes are determined by that which we believe to have happened, as much as by what actually happened. Peace will lead to war, therefore, so long as education, the newspapers and family conversation build up these intensely unfavorable stereotypes of all foreign groups. International peace is attainable only through cooperation between the people of different nations; but, as long as our pictures of others (and theirs of us) are so distorted, such cooperation is hardly conceivable.

Stereotypes of outgroups are heavily loaded with unpleasant characteristics by virtue of two processes, identifiable respectively as projection and animistic thinking.

Projection refers to our common tendency to see outside ourselves, elements which really are part of the Self. Thus, a strong sex urge may lead the person to believe that "everybody is over-sexed." "Cheaters" believe that others do a great deal of cheating. Very aggressive individuals see an excess of aggression on all sides.

Projection is most pronounced in relation to undesirable characteristics. The ego rejects the idea that it carries socially disapproved traits; instead, such traits are imputed to others. By doing so, a certain degree of release for the inhibited tendency is made possible. Self-appointed censors of burlesque shows, e.g., can see as many lewd shows as are available, without losing caste. The over-aggressive Hitler could point to "belligerent" France and Russia, thus justifying to his people the Nazi attacks on other nations. This type of propaganda was successful because it fitted in with pre-established stereotypes and was reinforced by the projection of aggressive intentions onto these other nations (Durbin and Bowlby, 1).

Animistic thinking generally identifies the common tendency to ascribe human psychological traits to the non-human environment. In the present context we are interested in man's tendency to ascribe his troubles to the malicious action of human agencies, rather than to impersonal natural or social forces. Primitive tribesmen blame crop failures on their neighbors; citizens of civilized nations ascribe economic depressions, lack of national prestige and other frustrations to the malice of neighboring states.

The term "black-white thinking" is some-

times used to refer to this composite of stereotyping, projection and animism. Each of us tends to think of his nation as pure and white; of foreign nations as evil and black. The intermingling of good and bad traits in every social group is overlooked. It is because of the prevalence of such thinking that an aggressive, war-breeding national policy is easily sold to the citizens.

Nationalism. The type of thinking just described is associated with a dynamic attitude known as nationalism. This is a convenient collective term for a set of inter-related beliefs and impulses: beliefs relating to the superiority of our nation and the inferiority of others; impulses aimed at the aggrandizement of our nation and the depreciation of others. Nationalism, of course, is but a specific case of the phenomenon designated as ethnocentrism. The members of a religious group or a labor union commonly manifest similar behavior regarding their organization.

The three characteristic elements of the nationalist attitude pattern are the delusion of national virtue, the delusion of national grandeur and the delusion of national persecution (cf. Stratton, 8). These are not equally present in all nationalisms; and it is only when the latter two are quite strong that we find a major menace to world peace.

The delusion of national virtue applies to the common beliefs in the purity of motives in national policy, the absence of aggressive wars in national history, and the high moral and cultural level of the population. Dynamically, it seems to involve a displacement of affection from the parents to national symbols. In all western culture the terms "fatherland" and "mother country" are common. The child tends usually to exaggerate the virtues and ignore the defects of his parents, and, later, of his nation. This view of the nation as parent-symbol is upheld by psychoanalytic observations of individuals (Hopkins, 2) and by statistical data on groups (Stagner, 6).

Delusions of national grandeur relate to the power of the nation, a quasi-divine mission to spread its domination over increasing areas, and a profound disregard of lesser peoples. These may be illustrated by the early American contempt for signed treaties with the Indians; British and Japanese imperialism; and in ultimate form, by the Nazi ideology. The dynamic

basis of this reaction pattern seems to lie in the displacement of desires for power and wealth from individual to national goals. The emotion of thrilled pride reported by most people watching demonstrations of national armed might supports this interpretation.

The delusion of national persecution centers around the belief—particularly characteristic of twentieth-century Germans—that other nations have conspired to prevent them from achieving their appropriate power and prestige, or that plots are now on foot to steal away such possessions. Such delusions are fairly general toward all foreign nations but pick out certain countries especially. Among European countries the fear of "Uncle Shylock" is pronounced; in the United States, suspicion of Britain and Russia is strong. Most of these reactions show the irrational characteristics of displaced aggression.

In common with the delusions of the neurotic and the psychotic, nationalism shows the characteristic reactions of repression and rationalization. Historic events which show the favored nation in an unpleasant light are conveniently forgotten. Other material is distorted, and some legends are complete fabrications. The stature of national heroes is enhanced, and the character of the population glorified by such devices. The irrational nature of this behavior serves to underscore the role of the emotional determinants of thought. Whenever deep loyalty to one group, or intense hostility to another, becomes a factor in one's judgments, logic loses ground in favor of wishful thinking. This is true, of course, regarding labor unions, church organizations and political parties, as well as nations.

Not all nationalism is war breeding. Pride in culture and affection for a locale are compatible with tolerance for others. When these characteristics are combined, however, with displaced aggressions and power drives, the result is likely to be disastrous. Obviously the same conclusion would follow from any other ethnocentric grouping: religious, economic or political, about which delusions of grandeur and persecution became organized.

Militarism. A third element facilitates the alignment of western populations behind leaders setting forth on an aggressive foreign policy. This is the glorification of war and fighting as good in themselves. We are quick to recognize this trait abroad but to ignore it at home. Our

history texts glorify the military commander; war-time presidents receive special fame. A pugnacious, reckless leader is praised for his courage; the cautious compromiser who keeps the peace is scolded for weakness.

While in peace-time there are few spokesmen who openly glorify war, there are many who exalt the deeds of past warriors and denounce any critics of war as an institution. The public schools teach the righteousness of past wars. Thus children acquire an attitude which, if not militaristic, is suitable for militarism to sprout, under appropriate conditions.

Scales for the measurement of "attitude toward war" administered in peace-time characteristically reveal the average man as neutral to mildly pacifistic rather than militaristic. Such observations are not of great significance, because the crucial peace-time policies which guide nations toward war are political and economic rather than military in character. It is none the less interesting that those groups which are most intensely nationalistic in their political and economic beliefs also exceed the average score for approval of war. Such groups include the organized veterans, persons of low educational status, etc. College graduates and members of pacifist societies are found to be strongly anti-war on these attitude scales, relatively low on nationalism.

The three factors sketched—stereotypes, nationalism, and militarism—show characteristic changes as a transition from peace toward war progresses. As media of communication carry predominantly unfavorable news about nation X, our stereotypes of X citizens take on a darker shade. Attention focuses on the necessity of action by our national government to protect its citizens; this intensifies nationalism. The feeling of persecution by X is likely to be strengthened first; then we intensify our delusions of virtue and grandeur. Militaristic attitudes seem to be last in developing, reaching the foreground of consciousness only when the conflict has gone too far for peaceful settlement. These generalizations, based on extensive data collected just prior to American participation in World War II, fit well with the interpretation of war already outlined. It would seem to follow that fundamental work on peace education must focus on breaking down stereotypes and building balances to nationalism, more than on militarism as such.

When compared with the period of tension leading up to hostilities, overt warfare shows only an intensification of trends already outlined. Dynamically the outstanding characteristic of the war period is the uncovering and release of tremendous aggressive impulses. For the soldier these may have self-preservative value, in that they motivate vigorous activity. For the civilian they are more of a problem. Even in a war plant it is difficult for him to feel that he is attacking the enemy directly. He does not have adequate outlets for his aggressions. The result is, only too often, attacks on radical groups, industrial leaders, racial minorities, etc. The inevitable frustrations of war-time living generate aggression which, for the soldier, is generally canalized into fighting; for the civilian, it may set off violations of necessary governmental regulations.

During the war the perceptual distortions associated with stereotyping, projection and animism are also intensified. The enemy becomes a complete concentration of evil. For this period, stereotypes of our allies may acquire a favorable tinge. This friendly reaction among Americans to Britain and France disappeared rather rapidly after World War I. The patterns established by many years of peace-time competition take precedence over the cooperative attitudes generated during a short war.

For the participants, warfare has many unpleasant aspects; yet it also has numerous gratifications. Our attention is naturally directed first to the release of aggression; some individuals get intense pleasure from uninhibited killing. Hopkins tells of a patient, a machine-gunner, who remained concealed until a column of Germans came quite close. He then opened fire, wiping out most of the enemy. He related this incident with obvious glee.

Beyond this elemental pleasure in destruction, soldiers also have extensive opportunities for exhibitionism, upon which many seize joyously. Most men have been frustrated in their desire to be the center of attention; as soldiers, this desire is gratified. Sexual mores are relaxed; the man in uniform has unprecedented opportunities for sexual gratification. Barracks life and continued close association with men seem to satisfy a repressed homosexual tendency in many cases. The break from dull routine, possibly from an unsatisfactory home life, and

opportunity for exciting adventure, also constitute compensations in a large number of cases. It should be emphasized, however, that such considerations have nothing to do with the occurrence of war; they are incidental by-products.

As has already been intimated, the goals which are decisive for the transformation of peace into war are those of a relatively small leadership group within a nation. In a very large number of cases, the goals involved are economic: seizure of an area rich in natural resources, protection of a preferred trade position or the destruction of competitors. In other cases the goal is primarily political: the capture or retention of power. Thus ruling groups resort to war as a "lightning rod" for revolutionary tensions within the nation; both the Romanoffs and the Hapsburgs are reliably reported to have been influenced by this consideration in 1914. The mechanism relied upon is displacement of hostility from the ruler to the foreign foe. (The device is successful only occasionally, although it has been recommended to monarchs since the time of Aristotle.) By judicious appeals to nationalism, the method succeeds temporarily; but if the war leads to hardships, revolutionary tendencies may reappear in more violent form.

The analysis so far is closely compatible with the views of experts in economics and political science (cf. Wright, 9) in so far as the impact of the social environment on the individual causes war. That it is possible to reduce the tensions of peace, and thus to decrease the probability of war, is a logical conclusion from these facts.

A number of prominent social psychologists were polled in 1942 (Stagner, 7) on long-range and short-range methods of rendering peace more stable. The short-range program endorsed was composed of familiar elements: a League of Nations, an end to imperialism and economic nationalism, giving the League veto power over national laws likely to set off international conflict, etc. It was conceded by most of the group that such a program was not probable of adoption, since it would run counter to irrational but powerful nationalist prejudices.

As a long-range program, therefore, the group favored ideas focusing around two themes: (1) that a decrease in the general level of frustra-

tion will weaken the aggressive tensions which might, through displacement, become a dynamic impulse toward war; and (2) that education for insight into such aggressive tensions would make displacement and irrational hostility less frequent and less dangerous.

Lowering the aggressive tension level calls for a decrease in biological and ego frustrations. Industrial democracy, a guaranteed minimum standard of living, consumer cooperatives, are some of the specific devices approved. These would raise the level of biological security and also free the average citizen from many ego deprivations which today are characteristic of our culture.

The so-called "sublimation" approach to world peace, identified with William James' famous essay, "The Moral Equivalent of War," was not endorsed by this group of psychologists. Believing as he did in instinctive pugnacity, James naturally advocated a program calculated to drain off in less harmful ways the aggressivity now canalized into war. Items introduced into the questionnaire to exemplify this approach were approved only by a minority of those answering. Forestalling aggression by avoiding needless frustrations appeared a more hopeful course.

It is recognized, none the less, that some minimum of frustration is inevitable. The child cannot be socialized without frustration of desires, and social living will inevitably entail some compromising of impulses. To channel the resulting aggression into constructive or harmless paths is the task of education.

Giving more people more education—even of the sort prevalent today—would help in the development of tolerance, reduce scapegoating and increase somewhat the chances for peace. To do its job competently, however, education should be basically reformed. The ideal educational program for war prevention would be constructed on a mental hygiene model, with less emphasis on traditional subject matter, more on human relationships (cf. Mark May, 3). Self-insight would be a primary objective. The control and direction of aggressive tensions into relatively constructive channels would be an important goal. Teachers would aim at breaking down black-white thinking and at preventing the growth of stereotypes.

Self-insight is integrally related to the preservation of world peace because it is only with

insight that reason achieves control of individual behavior. A man who lacks understanding of his own emotions and motives easily falls prey to propaganda based on economic, religious or racial prejudices; he may be induced to project aggression onto foreign peoples, and to anticipate attack in a wholly unrealistic fashion; he readily represses material conflicting with tendencies of positive emotional value, and he therefore acts in an irrational manner. The aggressive foreign policies which lead to war are popular with those whose thinking follows this pattern. An intelligently critical attitude toward war-breeding activities of national leaders is impossible except as the individual can assess and allow for his own emotional biases.

Except as an incidental by-product of some extracurricular activities, the control and direction of aggressivity have never been considered legitimate goals of education. Although the schools have required much memorizing of facts, they have done little with the problems of anger and hostility. Such teaching as we occasionally find is on an unrealistic level, urging the use of "will power" to control such tendencies. As anyone who has worked with aggressive children can testify, much more than will power is needed for success. The techniques which have been found satisfactory in the clinic (dismembering dolls, destroying valueless objects, expression followed by analysis) can and must be applied in the ordinary educative situation. As children become capable of understanding and dealing with their own inner impulses toward aggression, they will become more tolerant and less susceptible to blind prejudices against religious, racial or national groups.

This process will be aided by teaching aimed at preventing the formation of stereotypes. In this respect some schools have already made progress. Recognition of positive contributions by all ethnic groups is necessary. The prevalence of good and bad characters on both sides of boundary lines must be stressed. The recurrent tendency to polarize (categorize all incidents at one extreme or another of a continuum) must be persistently combated.

In striving for a general recognition of the essentially human character of all groups, we must develop in children the ability to identify themselves with others. This is necessary if the

Germans (for example) are to pause in the act of planning an aggressive policy toward Poland and ask themselves, "How will the Poles feel about this?" Mutual identification is necessary if representatives of two groups are to reach a harmonious settlement of conflicting tendencies. A general capacity for identification would render less probable any endorsement of imperialism and exploitation.

Education must have as its primary aim—above the three R's, above vocational training, above the classics—the development of an emotionally mature population. The policies which cause war between nations, churches, races and classes are policies which appeal to the emotionally childish.

The irrational quest for power through group action oppressing other peoples is a symptom of emotional immaturity. A belligerent insistence upon "our rights," without consideration of the rights of others, is equally immature. True cooperation between nations calls for an end to the type of animistic thinking which blames all our troubles on foreign enemies. It demands the acceptance and tolerance of differences between peoples, instead of attempting to force our standards upon all others.

It will not be enough to have realistic, emotionally mature leaders. They are always subject to replacement by neurotic demagogues if the general population is emotionally susceptible to the thrill of promised national grandeur, the phobia of national persecution and the sadism of group intolerance.

Economic and political reforms are important. Our economic system sets a pattern of selfishness which inevitably establishes a non-cooperative frame of reference. The fiction of absolute sovereignty must be replaced by an awareness of limited sovereignty in an inter-

dependent world. The cooperation displayed within a nation at war must be extended across boundary lines. Peace must be so structured that the average man can live a life of comfort, self-respect and hope for the future of his children. Political institutions must be set up to pattern for man's thinking the model of peaceful cooperation instead of war as the norm of international relations.

In this, as in so many other respects, it is difficult and even dangerous for a single nation to act in isolation. We shall need cooperation between groups in the various Great Powers, striving toward these goals more or less in parallel. A major problem in applied psychology, this task has so great significance that it merits unlimited effort. There seems no other pathway to an enduring peace.

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